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ELECTRICAL REVIEW

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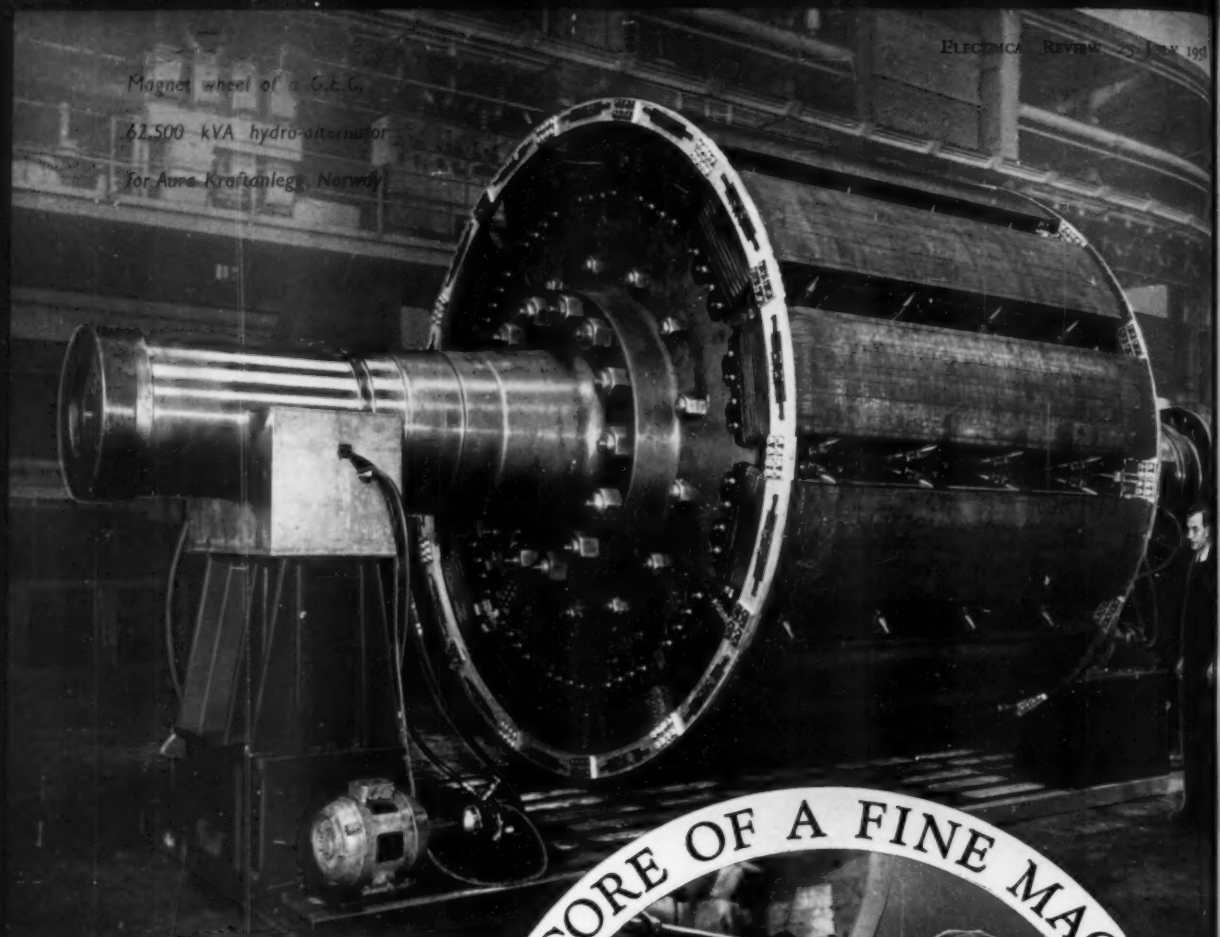

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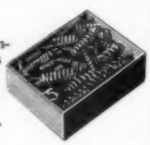

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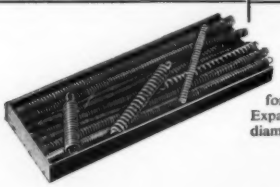

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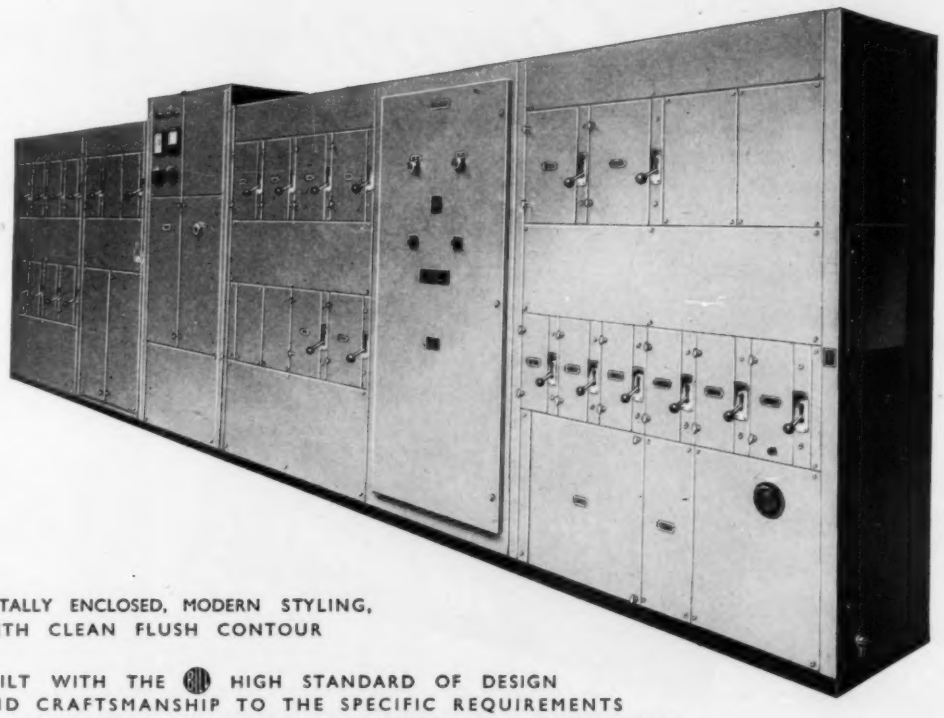

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The plugs are securely retained by a knurled nut which screws on to a thread on the socket. A rubber washer is fitted at the junction of this thread with the fixing flange, to prevent loosening of the knurled nut by vibration.

P.T.F.E. (poly tetrafluorethylene) insulation is used, ensuring low high-frequency losses, and a high maximum working temperature.

All contact surfaces are gold-plated for low resistance connection and to prevent corrosion on the centre pin, where the contact area is fairly small.

The plugs are suitable for use with coaxial cable having outside diameter of $\frac{1}{4}$" approx. (e.g. 50 ohm sub-miniature coaxial cable B.I.C.C., No. R.P.C. 1373).

Weights: L.1403/FP. 1 gm. approx. L.1403/BS. 1.5 gms. approx. L.1403/CS. 1.5 gms. approx. L.1403/RFP. 2 gms. approx.

These components and other new developments are fully described in the Supplement to our General Catalogue: copies are available on request.

ACTUAL SIZE

L.1403/FP. FREE PLUG. The cable to this plug enters along the axis of the plug. The rubber cover protects the cable clamp from damage and gives the plug a streamlined appearance.

L.1403/RFP. RIGHT-ANGLE ENTRY FREE PLUG. This plug has the cable entry at right-angles to the axis of the plug, enabling the cables to be "dressed-down" against a panel without the danger of sharp bends causing cable failure.

L.1403/BS. BULKHEAD ADAPTOR. This socket-to-socket panel mounting adaptor provides for the passage of a coaxial cable through a panel, in such a way that the cable can be disconnected on either side. It is ideal for use where a coaxial lead needs to be continued behind the main panel of equipment.

L.1403/CS. CHASSIS MOUNTING SOCKET. This socket is designed for use where the feeder enters equipment, and is not required to continue as a coaxial cable, as the components associated with it are in close proximity to the socket. It is fitted with soldering tags which are gold-plated for ease of soldering.

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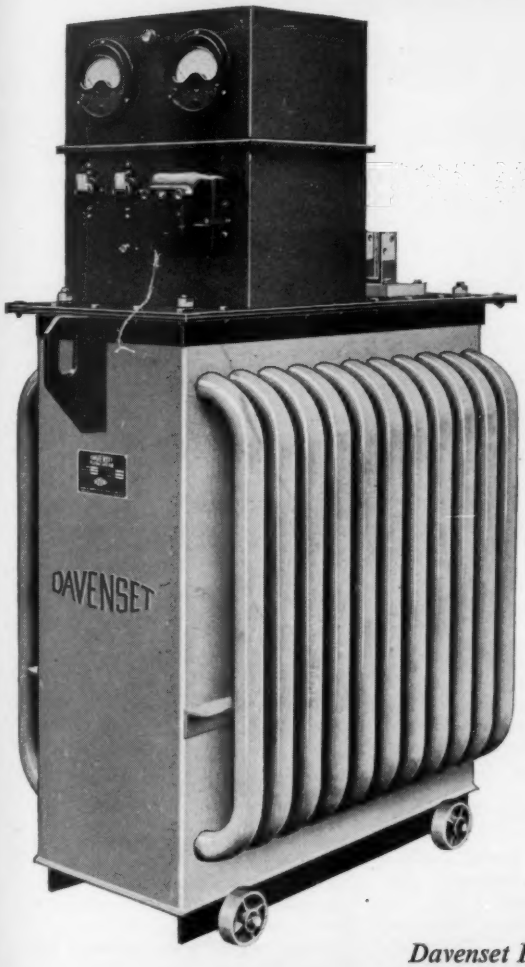

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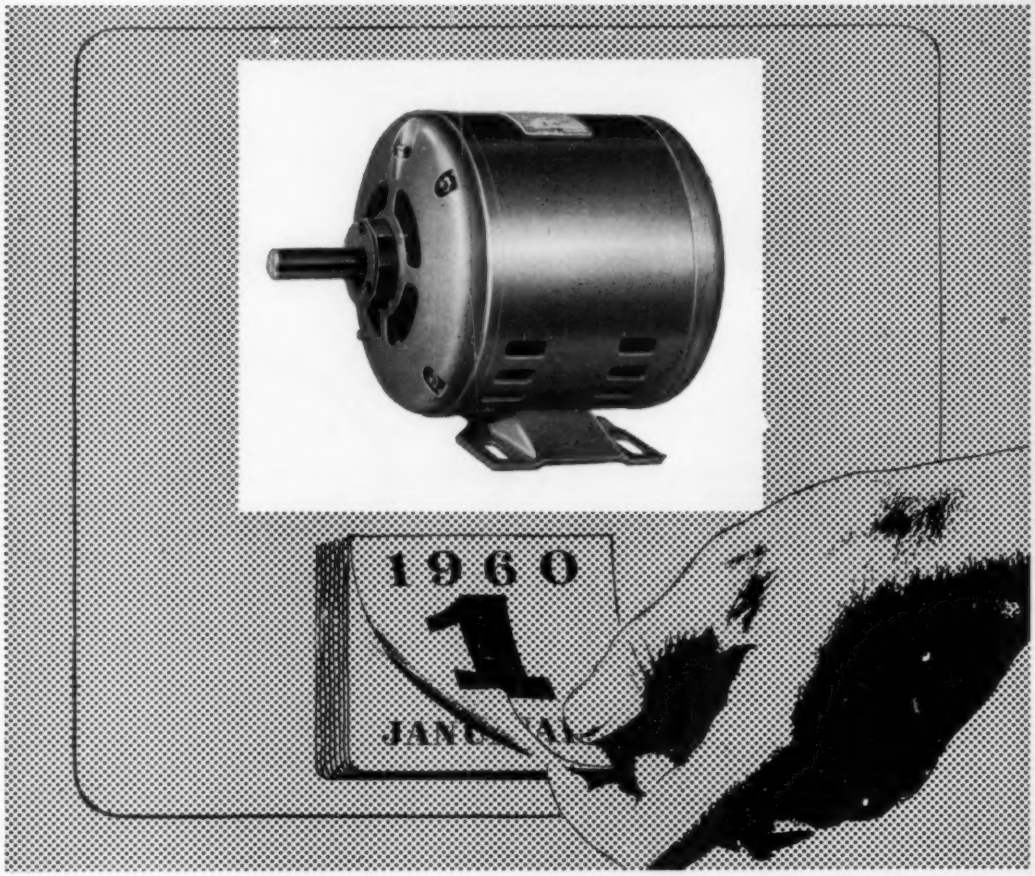

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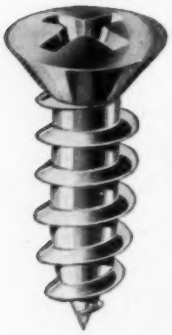

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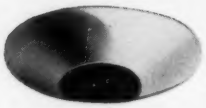

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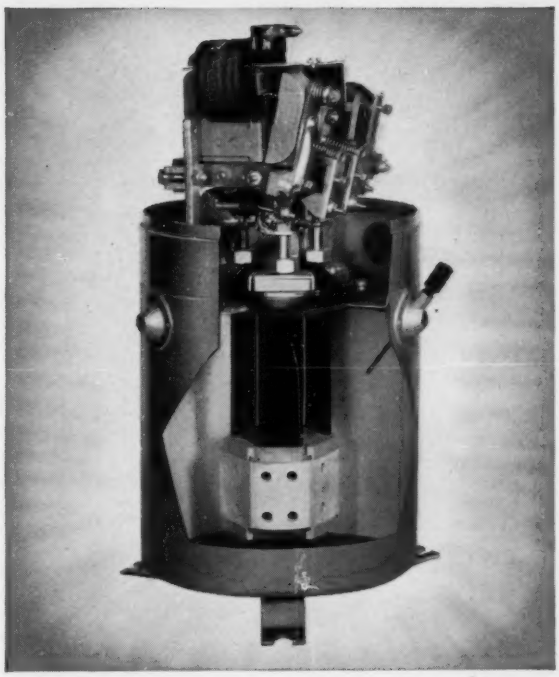

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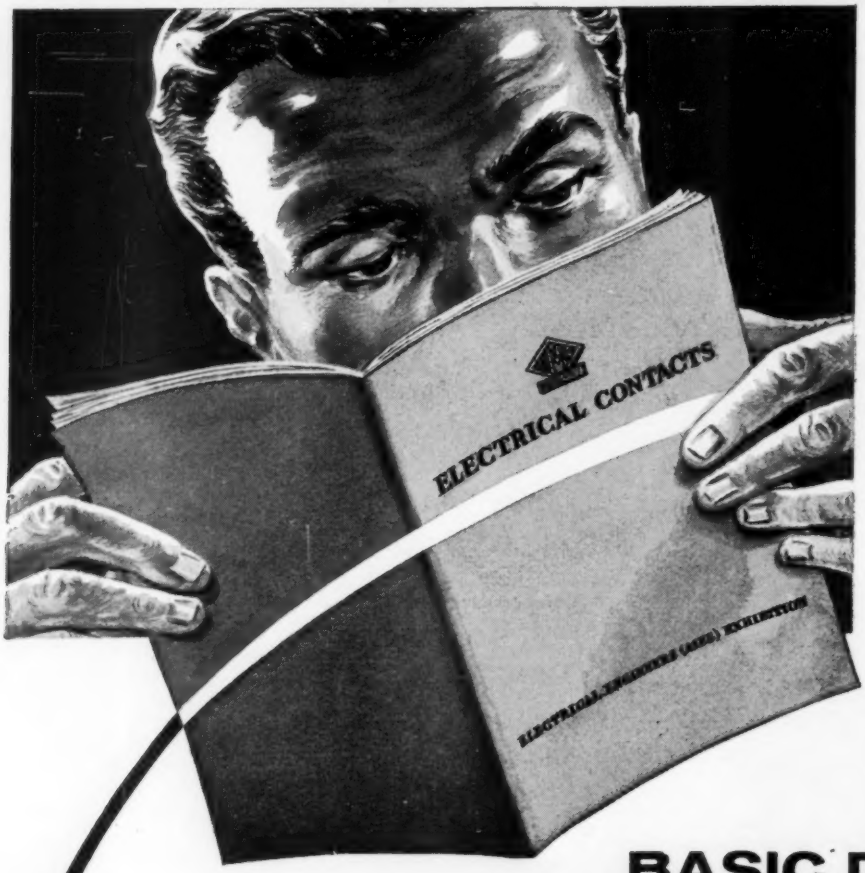

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Concise yet complete, this booklet contains the essential information on JMC contact materials and components that will enable the electrical engineer to make the right choice for the majority of applications.

The properties and availability of the materials are detailed, with notes on their service characteristics and recommendations for the selection of contact materials for all the common forms of electrical equipment. The very wide ranges of JMC standard contacts are also described.

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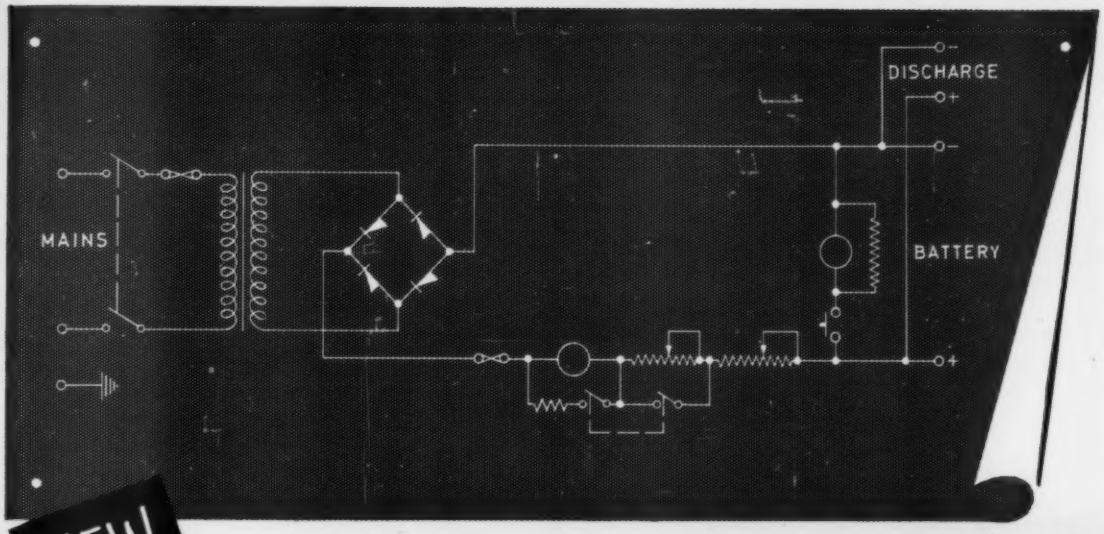

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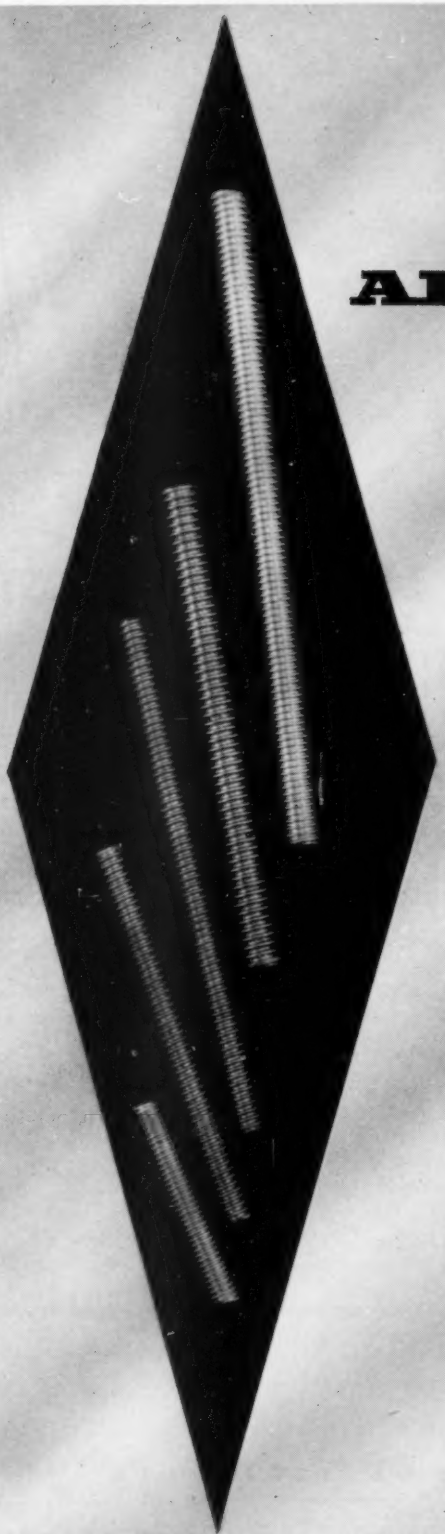

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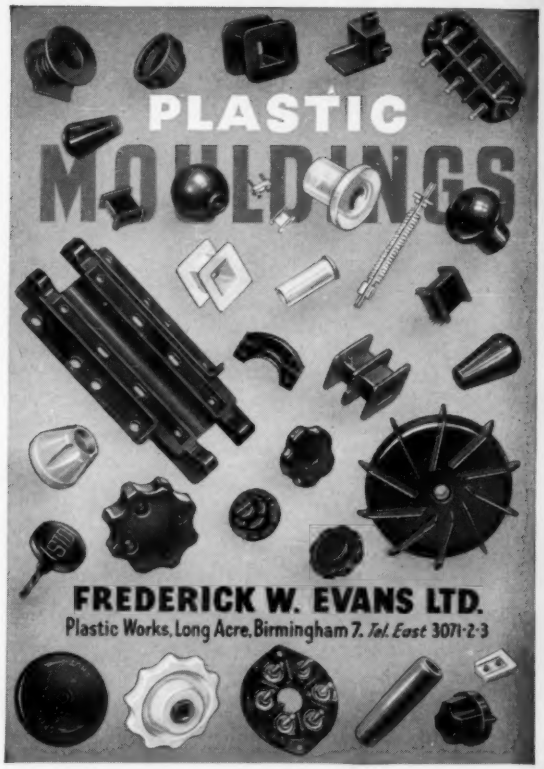

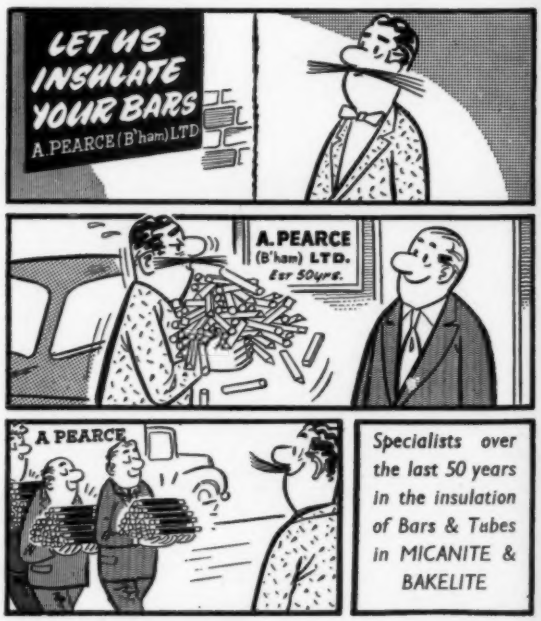

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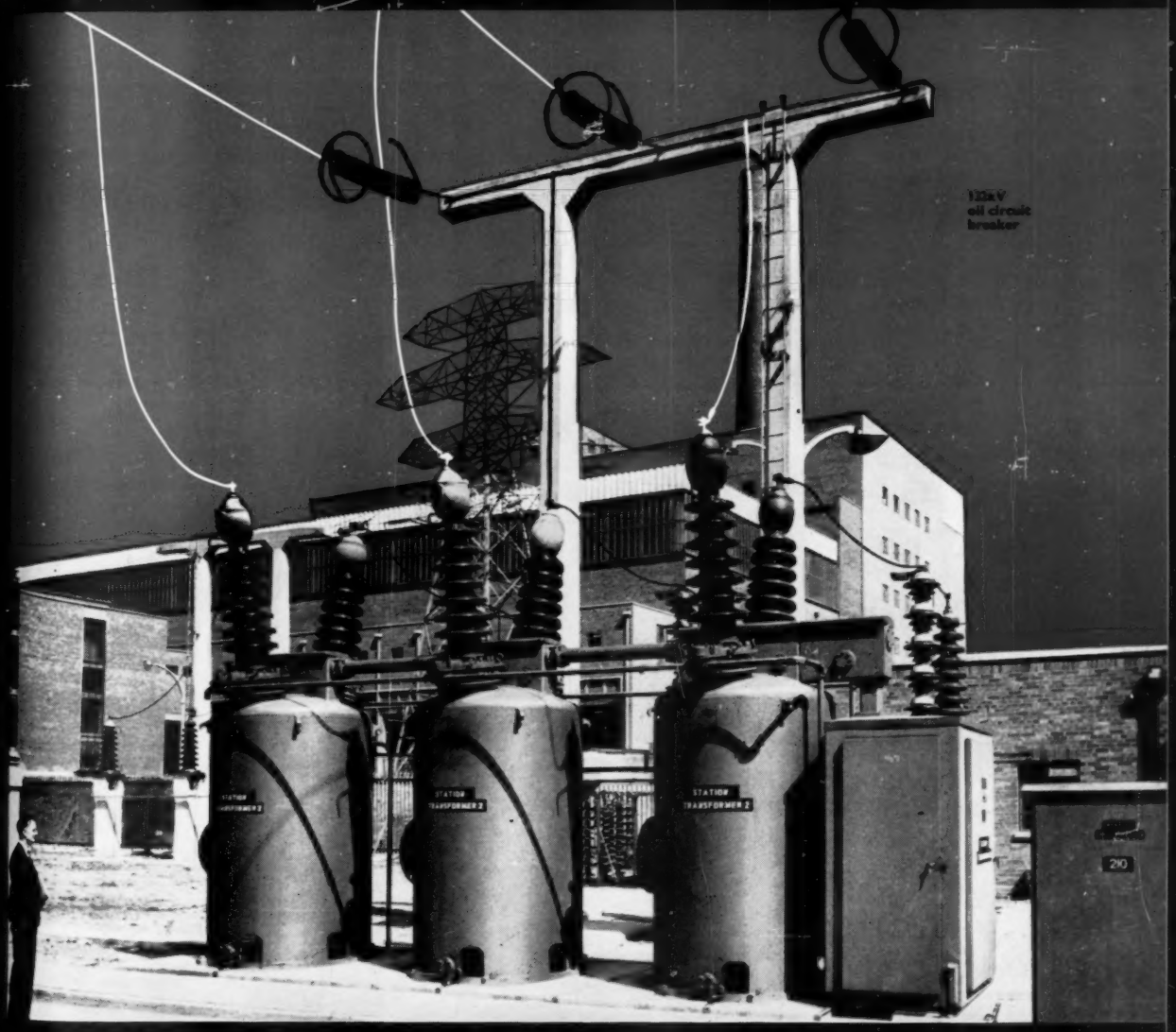

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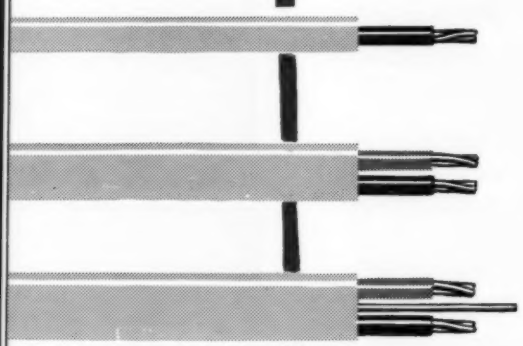

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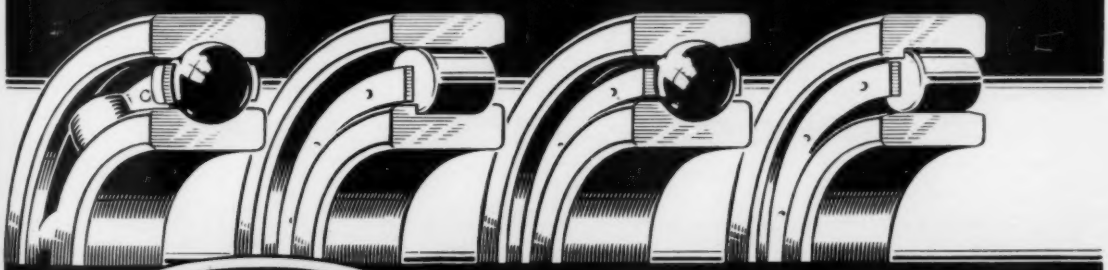

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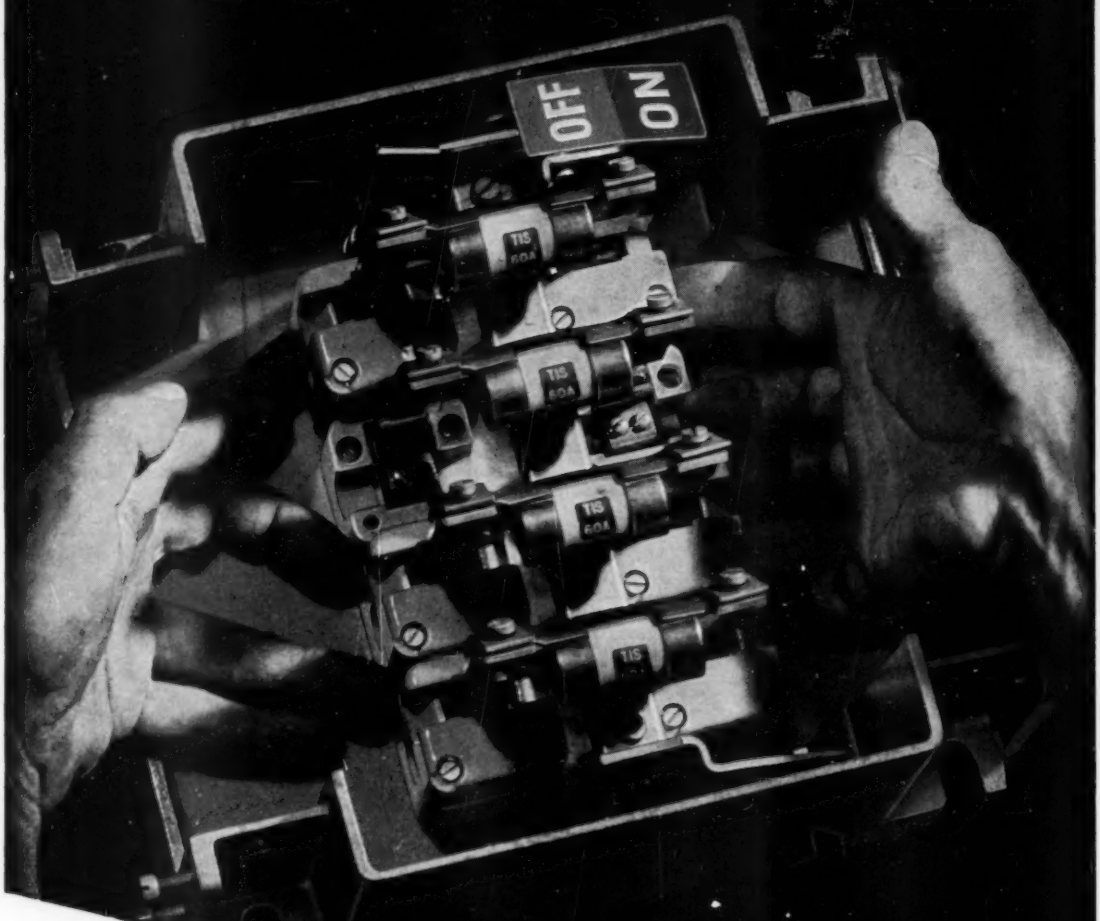

to control electricity

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The mark of superiority in Switch and Fusegear

A camera view of the 'Sandaclad' one of the most modern and praiseworthy designs in the Sanders range.

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Available in glass or lead-lined wood boxes in a range of capacities from 100 a.h. to 5,000 a.h.

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In moulded glass containers with sealed-in lid. Capacity range from 10 a.h. to 200 a.h.

This illustration shows a TUNGSTONE PASTED PLATE Battery of 168 cells—Type THTL6H.

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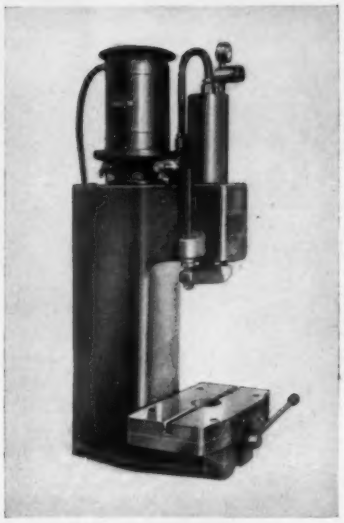

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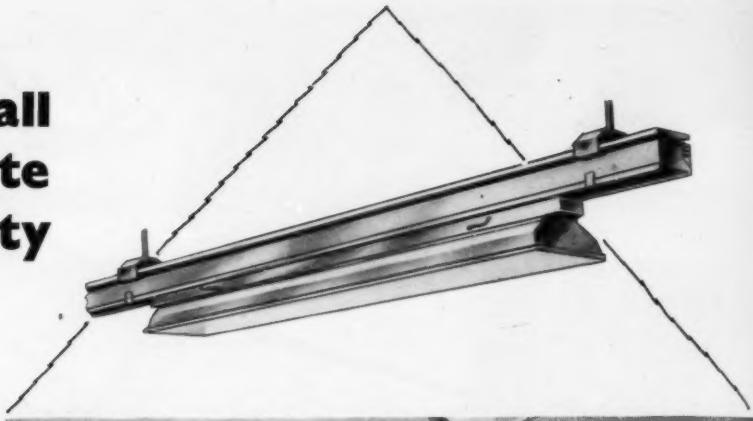
above all for complete adaptability



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A typical illustration of 3,000 lampways of Thorlux high quality vitreous enamelled trough reflectors on SLYDA-LONG Trunking.

INDUSTRIAL LIGHTING EQUIPMENT

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THROWS LIGHT ON INDUSTRY

Manufactured by
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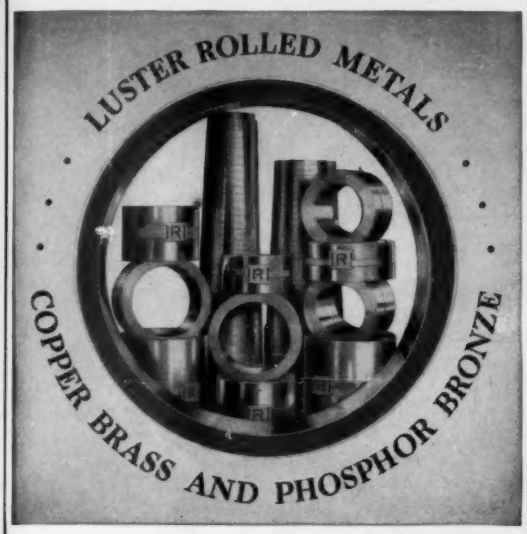

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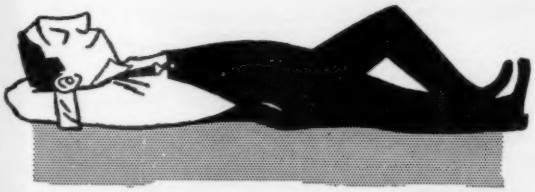

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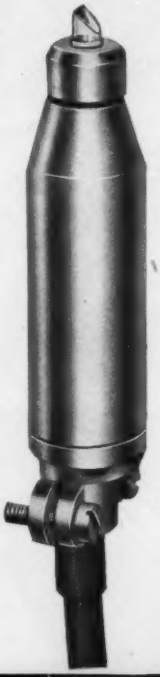
in miniature!



This picture of the new Elcontrol Viewing Head is life size—so you see it *is* a pretty small Viewing Head, thanks to the very small photocell tucked away inside it.

Small itself, it also responds to very small observed objects.

Photoelectric controllers are ideal for most control jobs where movement has to be detected—tell us what you want to do and we will gladly help you.

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This is the new photorelay—also a small compact unit in a variety of types for different applications

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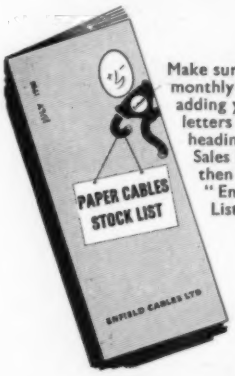

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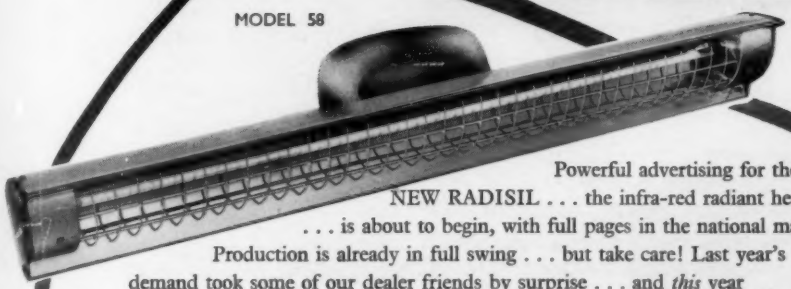
LAUNCHES THE NEW Radisil

MODEL 58



Powerful advertising for the NEW RADISIL . . . the infra-red radiant heater . . . is about to begin, with full pages in the national magazines.

Production is already in full swing . . . but take care! Last year's unprecedented demand took some of our dealer friends by surprise . . . and *this* year

THE NEW RADISIL IS MORE ATTRACTIVE THAN EVER

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SALES POINTS

Range of loadings : 400, 600 or 800 Watts.

Sharply beamed heat means warmth from the moment of switching on.

Easy fixing to walls.

Easy element changing.

Attractive ivory enamel finish. Gold finished grille, heavily chromium-plated reflector, and an unusually high standard of manufacture.

Steam-resistant, splash-proof. No exposed, current-carrying elements or trailing flex and therefore completely safe.

Warmth cuts straight through draughts.

NEW Price–NEW Styling–
the NEW Radisil again takes the lead

Engelhard Industries Ltd.

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R3/28 SLOUGH BUCKS

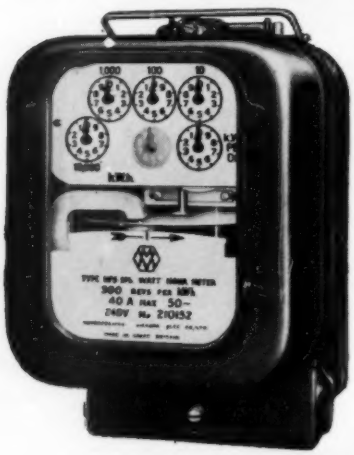
Ah... for a **Radisil** *THE INFRA-RED RADIANT HEATER WITH NO EXPOSED (LIVE) CONTACTS*

Count Seven . . .

and choose the
METROVICK

TYPE NF5 Watt-hour Meter

Exceeding the already high standards of meter performance today, the type NF5 watt-hour meter is the result of demand for even wider domestic load ranges. Built to give many years of sensitive and dependable service, its design incorporates the following seven important features :



- *High degree of accuracy over wide range of loads*
- *Complete temperature compensation*
- *Damping system giving complete stability*
- *Simple and accessible adjustments for calibration*
- *Resilient lower (jewel) bearing*
- *Easy dismantling for maintenance*
- *Available with six-figure cyclometer register*

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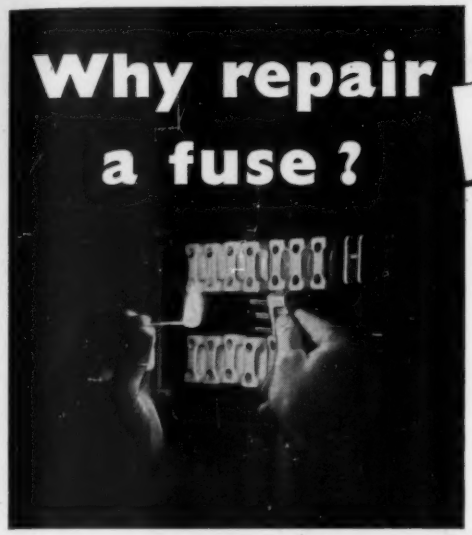
METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

An A.E.I. Company

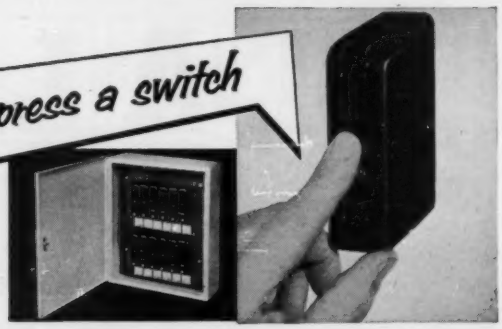
For Meticulous Metering

G/A 304

Why repair a fuse?



just press a switch



THE S.141 PLUG-IN MINIATURE CIRCUIT BREAKER

—the simplest, quickest, most effective method of restoring a circuit. When the circuit is overloaded, the switch automatically snaps off, instead of the fuse blowing—thus breaking the circuit and preventing damage. The Circuit Breaker takes the place of the fuse. Providing the overload is temporary, it is only necessary to switch on again to restore the circuit. That's all there is to do, and only a repetition of overload or fault will re-break the circuit.

The Breaker itself consists of a unit which contains the switch, and a socket which is fixed to the wall. Breakers are available in various current ratings and it is a simple matter to alter circuit loading if necessary, by plugging the unit of appropriate amperage into the required socket.

The S.141 is ideal for use in hospitals, offices, theatres, factories; and it is also suitable for private housing estates and flat projects. Ratings up to 30 amps. 250 volts AC/DC.

Send for full details and illustrated leaflets of the S.141 Circuit Breaker.

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SEND FOR LIST OF STANDARDISED SIZES

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THE ELECTRIC DEPÔT LTD., Redbrook Lane, Brereton, Rugeley, Staffs

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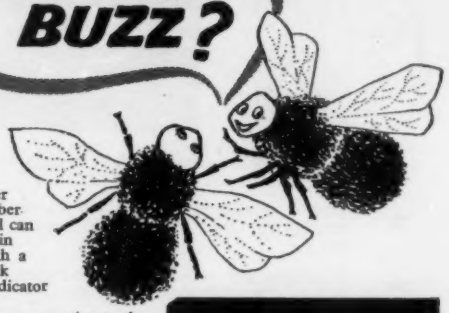

Any member of any number of personnel can be located in seconds with a Sterdy Clock Location Indicator System.

A buzzer draws attention to the indicator and the number combination illuminated denotes the individual required. With a 6-way board, with flashing lights, as many as 728 different signals are possible at the 'push of a button'.

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4 Star Features!

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★ BODY CAN BE MOUNTED DIRECT TO CEILING, OR TO STANDARD CONDUIT BOX.

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Otters press their contacts together to open them with a "SNAP"

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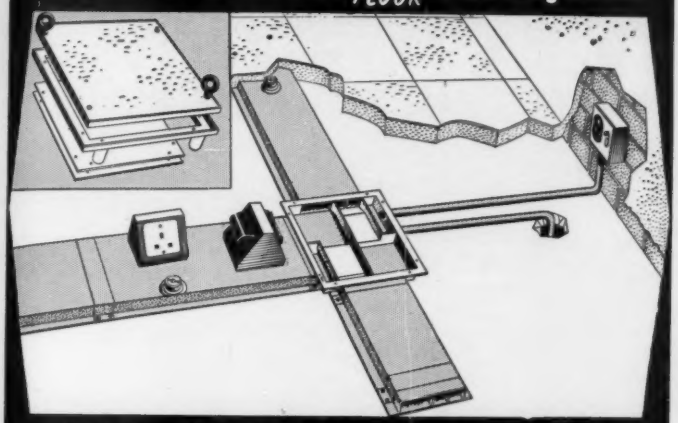

provides for all cables to be accommodated in one duct with adequate screening between telephone and power cables

LATEST DEVELOPMENTS

- Remote adjustable floor frame in brass with recessed lid to take final floor finish.
- Waterproof Junction Box.
- Ducting fitted with adjustable outlets.
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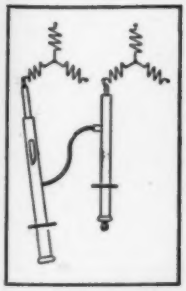
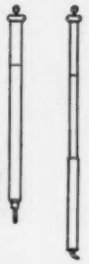
Visible indication on contact with a live conductor, or in case of high voltages as soon as Detector approaches and before contact is made.

Range 2,000 to 35,000 V.



'WESTMINSTER' PHASING RODS
To locate interconnections between two A.C. systems.



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Give visible and audible indication of whether lines and contacts of draw-out switchgear are alive or dead.

NO EARTH CONNECTION REQUIRED

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TESTED TO 20,000,000 OPERATIONS

—that's *one* reason for choosing BROOKHIRST Snap Action Limit Switches—well-proved reliability. Other reasons: positive quick make and break changeover contacts, consistently accurate tripping, robust splash-proof or watertight enclosure.

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VOLTAGE REGULATORS for overseas supply schemes

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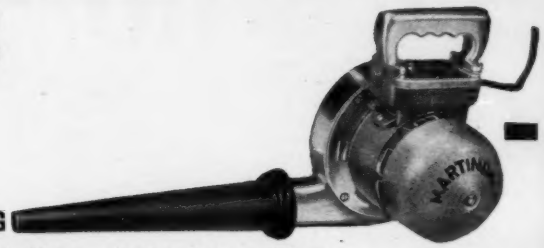
B

The NEW MARTINDALE Portable BLOWERS



POWERFUL BLOWING

The powerful Martindale Blowers direct a stream of dust-removing air into every inaccessible crevice of electrical and other machinery, thus removing a common cause of short circuits and motor failures.

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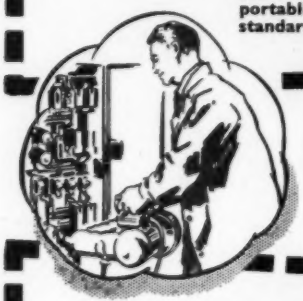

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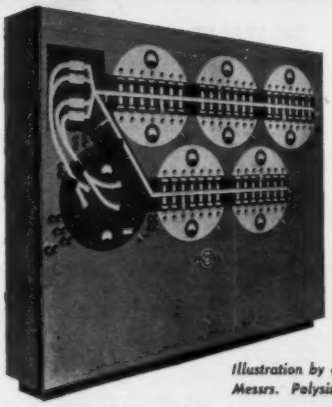

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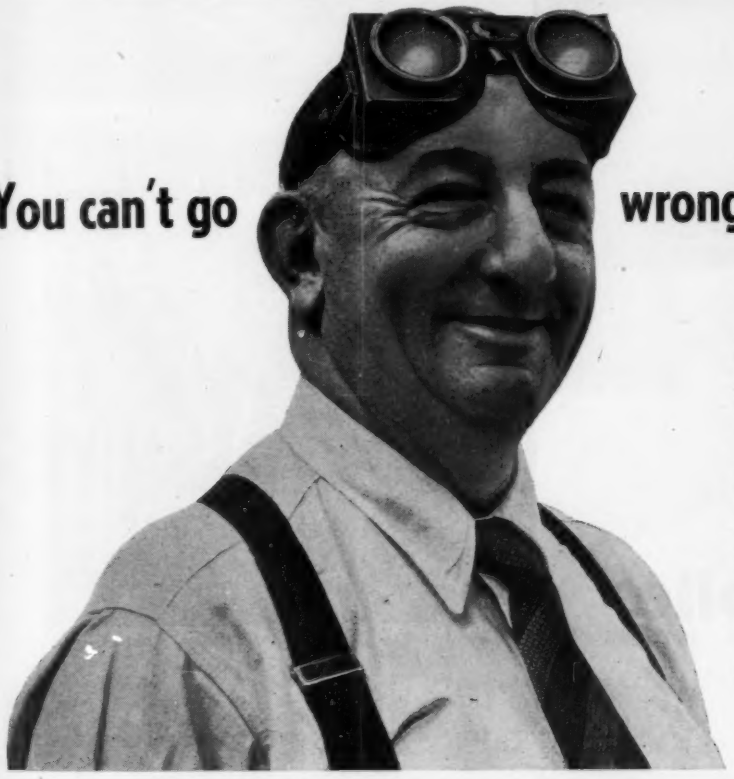

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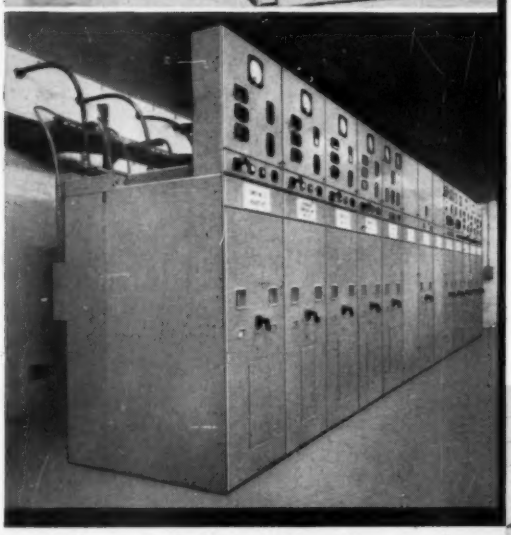

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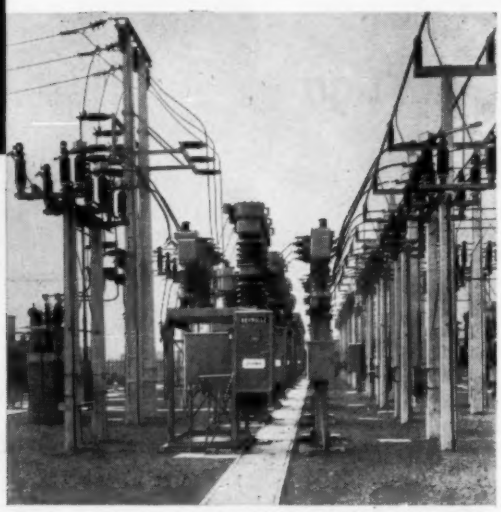

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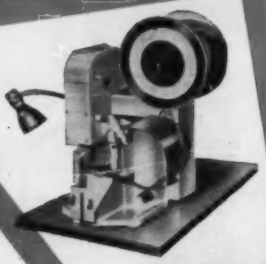

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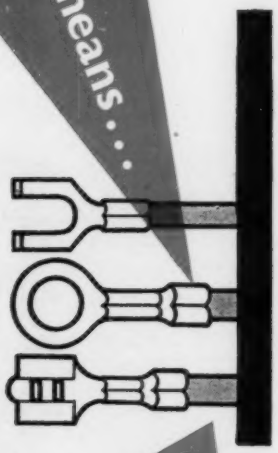

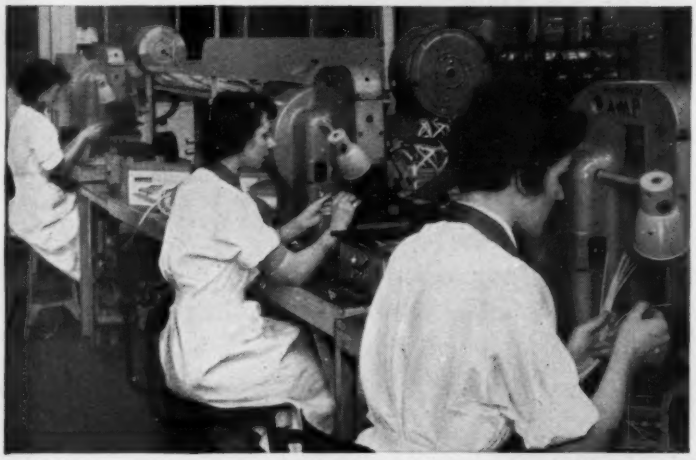

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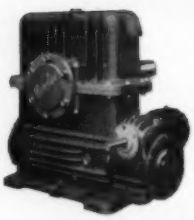

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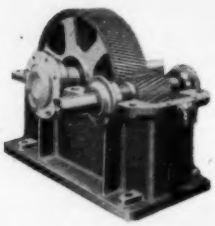

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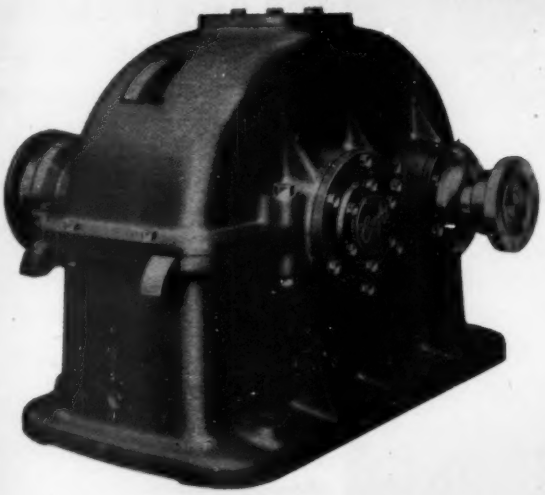

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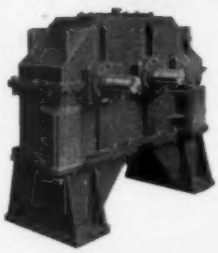

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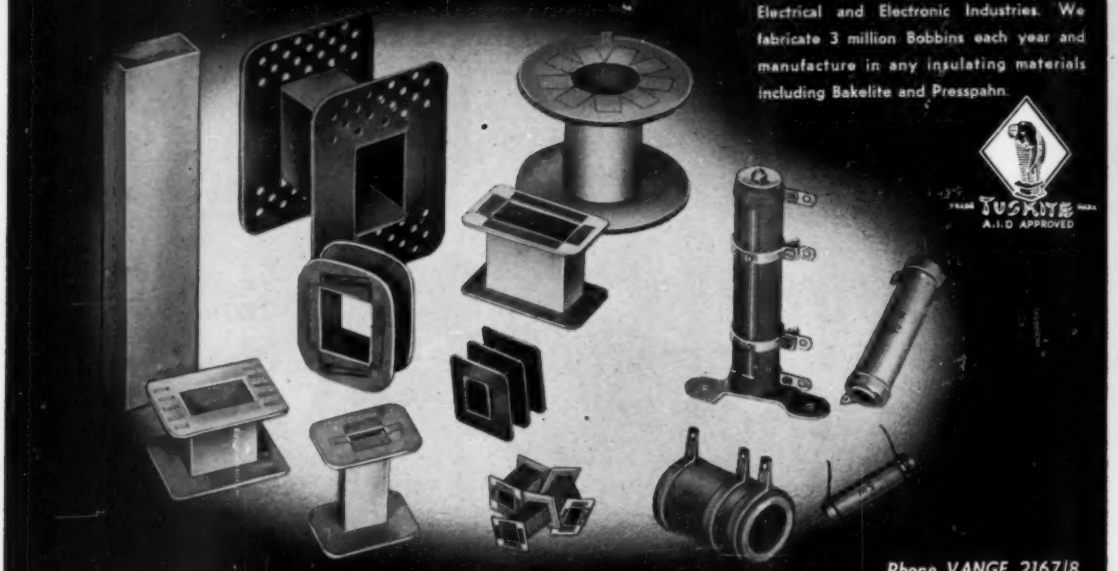

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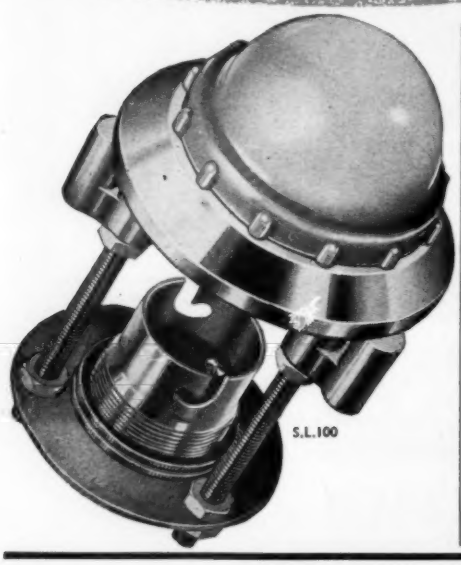

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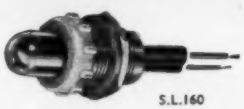

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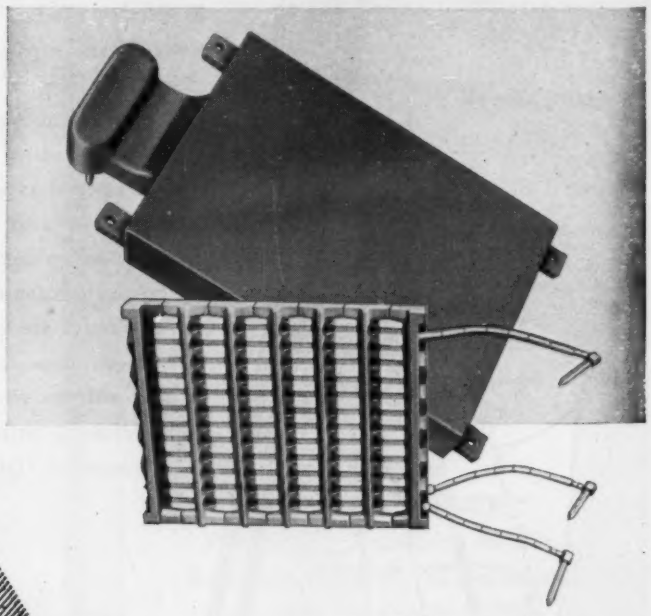

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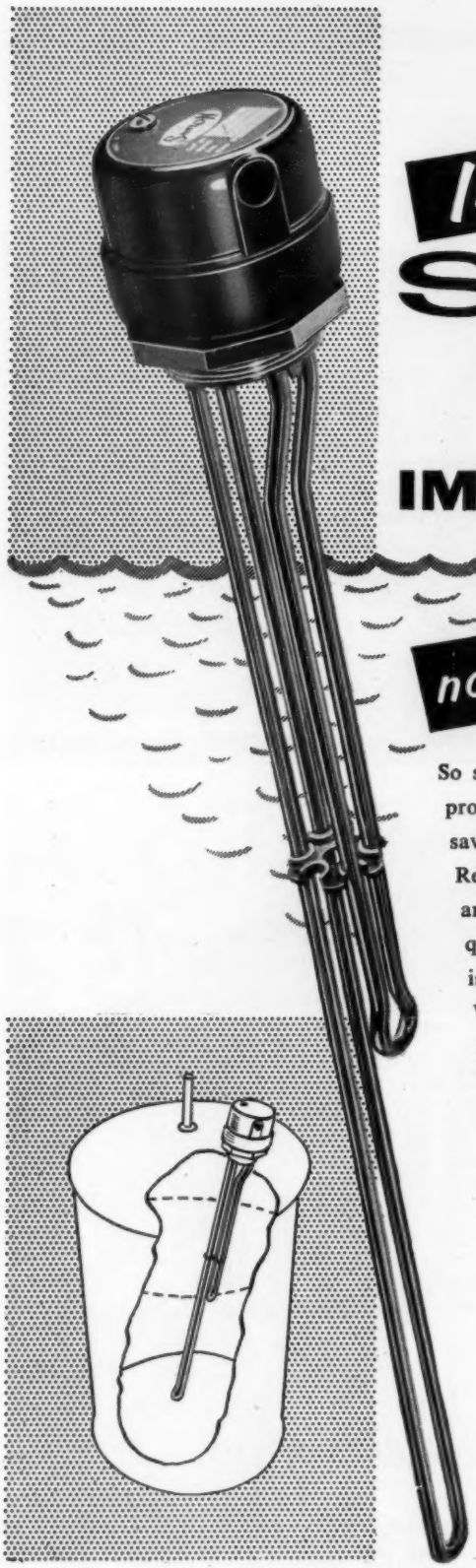

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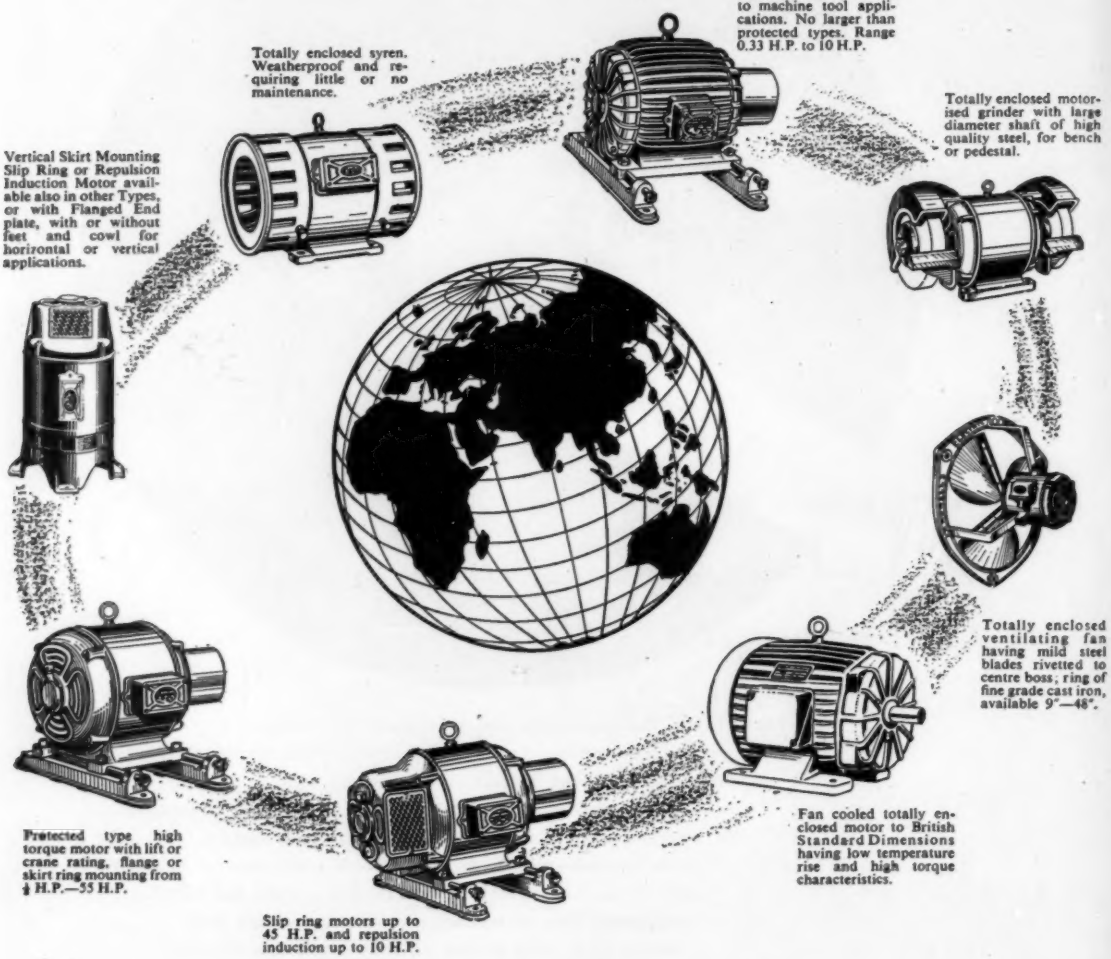
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Load Factor Improvement 141
At this year's Power Convention Sir Christopher Hinton emphasised the importance of load factor improvement in view of the comparatively high cost of nuclear power stations. In this connection some of the points brought out by Mr. D. Bellamy (see page 164) are discussed

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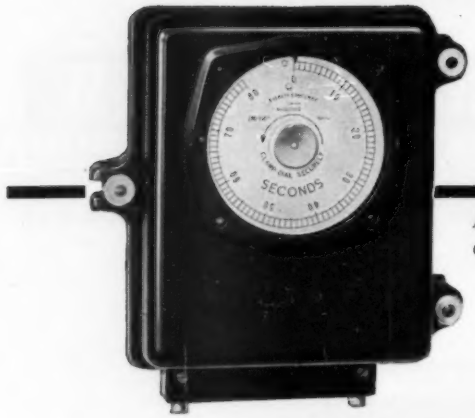

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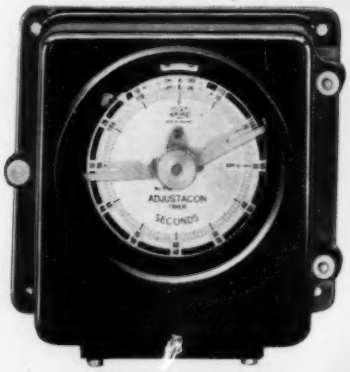

Adjustacon Timer

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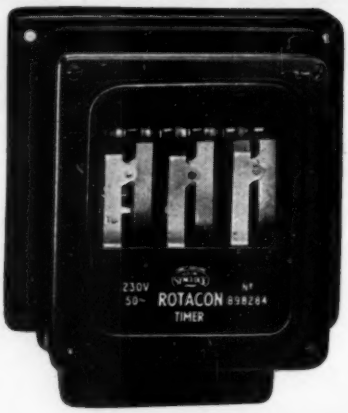

Rotacon Timer

There are many applications for timing devices where a user wishes to accommodate the operative unit in his own housing along with other apparatus. Rotacon units are particularly suited to meet this and can be supplied accordingly.

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ELECTRICAL REVIEW

25 July 1958 Vol. 163 No. 4 Established 1872

Load Factor Improvement

IMMEDIATE and automatic response to the calls on its services is an outstanding characteristic of electricity and to this is owed much of its great merit of convenience in use. On the other hand, because the moment of its production is decided by the requirements of consumers at all hours and seasons, it follows that it is impracticable to arrange for continuous full employment of generating and distribution plant. The urgency of getting much closer to this ideal, however, was emphasised by Sir Christopher Hinton at the British Electrical Power Convention last month (see our issue of 20th June) in view of the comparatively high capital cost of atomic power stations.

To generate the greatest number of kWh from each kW installed has always been the aim of electricity supply authorities. Their efforts to this end are analysed on a later page by Mr. D. Bellamy, chairman of the Yorkshire Electricity Board, who points out that a more realistic assessment of the national system load factor would return an appreciably higher percentage than that usually adopted. What the Electricity Boards can do to effect improvement, he has no difficulty in showing, is severely limited by factors quite outside their control. There is notably the very much lower "load factor," relative to electricity supply, at which production capacity is operated in almost all industries. This can only partly be compensated for by diversity of electrical demands between individual works and between this class of user and others, such as domestic and transport.

Since the cost of electric power to industrialists forms too small a proportion of the value of their finished products in the large majority of instances, little can be done by way of financial inducements in tariffs that will persuade them to alter their normal practices or hours of working.

New kinds of electrical applications are being constantly developed which favourably affect the position either through diversity in time of incidence or through extended periods of use. An important example, to which Mr. Bellamy refers, is the introduction of floor warming by electric cables buried in concrete. That it provides a seasonal load may have value in permitting more latitude in the routine plant overhauling programme, which at very high yearly load factors might even call for the provision of more generating capacity. The rate of extension of this heating system, as is the case with so many other possible electrical developments, depends upon the willing co-operation of those outside the electrical industry in a departure from conventional practice. In this, as in all contacts with existing and potential consumers right down the scale, considerable and varied skills are required to implement the utilisation research work being carried out by the supply authorities.

POWER STATION CONTROL

During recent years the unit operation of generating plant has become well established in this country, the general arrangement being one boiler feeding one turbo-alternator set with no steam interconnections between adjacent boilers. This has led to the adoption of unit control rooms containing all the controls associated with either one or two turbo-alternator boiler units. In an attempt to improve operational efficiency still further there now appears to be a tendency to combine these unit control rooms and the main electrical control room into a single central control room for the entire power station.

A particularly good illustration of this practice is to be seen at Rogerstone power station, described in the following pages. The control scheme here is extremely well laid out in a sound-proofed and air-conditioned room with double glass windows overlooking the turbine hall. Unit control panels for the boilers and turbines are provided together with facilities for all electric loading of the generators and the switching of the 66 kV substation through which the plant is connected to the local network.

RIVER POLLUTION

Another interesting aspect of Rogerstone power station is the water treatment plant, which is much more complex and comprehensive than that usually found in British power stations. The River Ebbw, which runs alongside the station site, appears to be unusually heavily polluted and before it can be used for make-up it is injected with a mixture of ferrous sulphate and lime to prevent flocculation before entering clarifying tanks. From what we saw when we visited the station it would appear that a considerable quantity of these two chemicals will have to be used to produce water of the requisite purity. It seems to us a great pity that with the recent implementation of the Clean Air Act something similar cannot be done about our rivers.

CONTINUED EXPANSION

Although the post-war boom enjoyed by the European engineering industry has given way to a more normal rate of development, activity has been maintained at an encouragingly high level. During a period (1953-57) when manufacturers have had to contend with a mild recession and Government restrictions on investment and domestic consumption, total production increased by 40 per cent and deliveries of electrical goods by 47 per cent. In contrast, the United States engineering industry raised its total output in this period by only 8 per cent and of electrical engineering goods by 12 per cent.

A recent O.E.E.C. report, which is the subject of an article on page 151, takes a fairly optimistic view of the prospects for future development. Owing to increased capacity, orders at the end of 1957 represented a smaller reserve of work than was the case one or two years earlier, but demand from O.E.E.C. countries will probably continue to expand. Demand from other countries is more difficult to predict owing to the changes caused by the continued industrialisation in underdeveloped countries, the fluctuations in the prices of primary products on which their economy depends, and the effects of the level of economic activity in the United States. These factors are of particular concern to manufacturers in this country whose exports to non-European countries represent 80 per cent of total exports. More than half of German exports, on the other hand, went to O.E.E.C. countries. This suggests that in addition to fighting the recession by a continued increase in its efficiency, British industry should give greater attention to the steadily growing demand from European countries.

M.K.S. SYSTEM

The M.K.S. system of units offers a number of advantages and its use has been recommended both by the Institution of Electrical Engineers and the International Electrotechnical Commission. Despite these advantages, only a comparatively small number of professional electrical engineers who are practising to-day are fully conversant with the M.K.S. system. These people will find the new B.S. 2990:1958 very useful. This standard, "Rationalised and Unrationalised Formulæ in Electrical Engineering" (price 4s 6d) is in the form of tables and explanatory notes. In the tables, the forms of the more important relations are given in the rationalised and unrationalised systems.

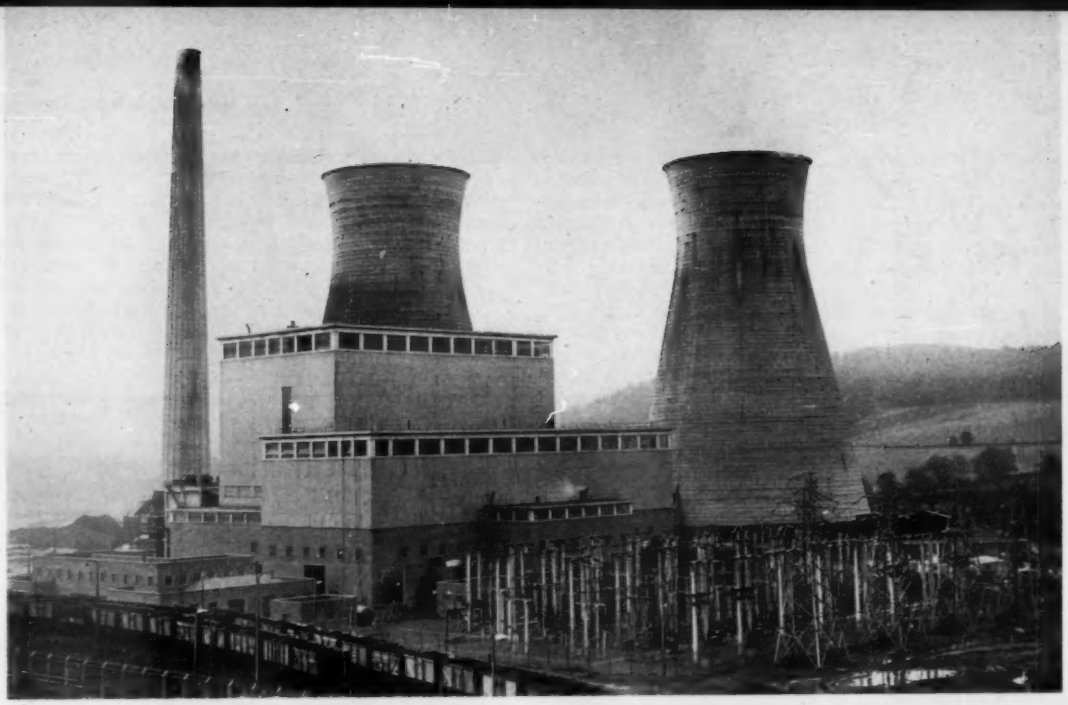
Most of the practical units used by electrical engineers have not been altered by the use of the M.K.S. system, but the concepts behind them have been simplified as have also many formulæ. A clearer understanding of electrical science is one of the great advantages of the system and is especially useful when teaching the fundamentals of electricity.

EDUCATION AND INDUSTRY

Last week a summer school was held by Metropolitan-Vickers for professors and heads of departments in universities and technical colleges. The occasion provided an opportunity for those attending the school to see how their former pupils continued their technical education by means of apprentice training schemes. Many interesting educational aids were on view and the professors, no doubt, came away better equipped to advise undergraduates concerning industrial courses and the apprenticeships which are open to them.

While summer schools provide the opportunity for teachers to see the practical side of manufacture, many new recruits to the teaching profession unfortunately have little industrial experience. It appears that this is due mainly to the reluctance of education authorities to appoint people from industry to vacancies with a comparable rate of remuneration instead of upgrading assistant lecturers. We feel that the many problems associated with this issue are not insurmountable.

Another benefit resulting from the school was that, complementary to the articles in the technical Press relating to new developments, the new methods, processes and equipment could be seen in the course of manufacture on the shop floor. We hope we shall see many more of these summer schools particularly for teachers in universities and technical colleges.



Electrical Review 25 July 1958

POWER STATIONS OF 1957

ROGERSTONE

120 MW PLANT NEARING COMPLETION

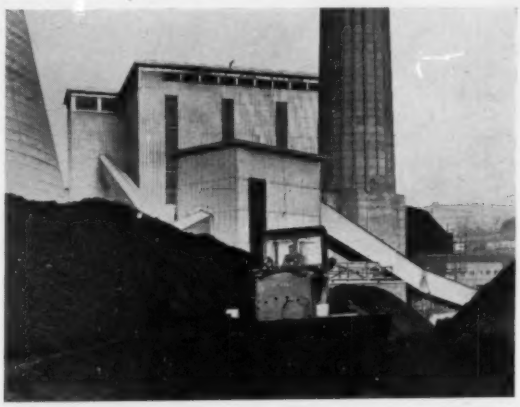
THE increased industrial load in South Wales during and immediately after the war made it essential for additional generating plant to be installed, and in 1943-44 the first two 30 MW turbo-alternators were commissioned at Llynfi power station, which is situated at the western end of the 66 kV network. The remaining two sets at Llynfi were commissioned in 1951. It was obvious, however, that additional generating plant was needed at the eastern end of the 66 kV network and a number of suitable sites in the vicinity of Newport, Mon, were investigated. Planning permission was eventually granted for a site at Rogerstone to be developed, and a starting date of 1st September, 1954, was given.

This 120 MW station accommodates two 60 MW hydrogen-cooled turbo-alternators supplied by C. A. Parsons & Co., Ltd., and two Babcock & Wilcox 550,000 lb/hr pulverised fuel fired boilers arranged for unit operation. These two boilers and their associated turbo-alternators have now been commissioned and the station has virtually been completed.

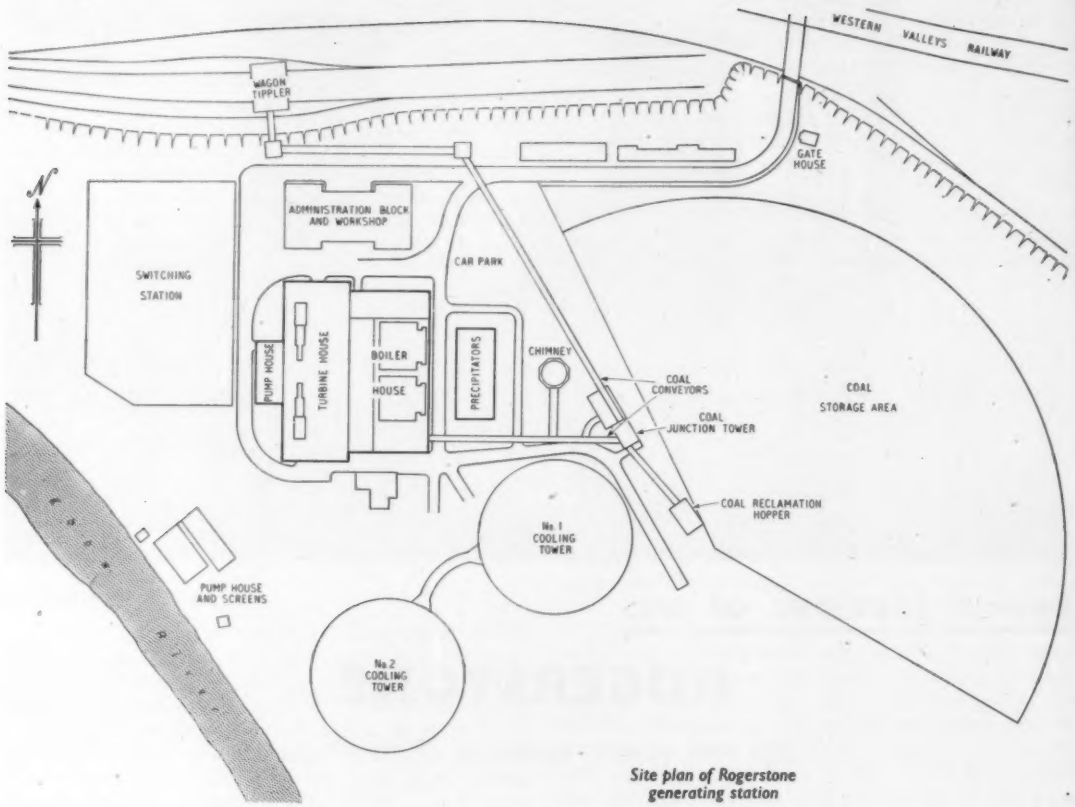
The site covers an area of about 90 acres some three miles to the west of Newport on the eastern bank of the River Ebbw. It consisted of medium fertility farmland and trial borings showed that the subsoil was mainly composed of alluvial deposits of boulders and cobbles to a depth of about 20ft, below which rock marl was found. The average level of site was +110ft O.D. and as the flood level of the River Ebbw is +111ft O.D., the area occupied by the main buildings was raised to +114ft O.D. by using the spoil from the deep cutting which had to be excavated for the access road.

The original road access to the site was via Heol Gerrig, an extremely steep lane leading down to the river, and it was necessary, therefore, for a new access road to be constructed. To maintain the gradient of this new road at 1 in 20 about 54,000 cu yd of spoil was excavated to form a cutting. The British Railways main Newport and Western Valleys line is about 20ft above the level of the site and this made it impossible to arrange for a spur to be taken to site level. The main station coal sidings have therefore been laid on waste, tipped up to the level of the main line.

To support the very heavy loads of the main station buildings, 149 Benoto piles were sunk, each of which is capable of withstanding a load of up to 300 tons. These



Coal storage area showing stocking-out tower in centre background



Site plan of Rogerstone generating station

piles are formed by drilling a one metre diameter hole down to bedrock and filling it with 4in mesh stone and colloidal grout. The average length of the piles is 65ft and the majority have reinforcement only in the top portion. The piles supporting the chimney and adjacent to the circulating water pump house are, however, reinforced over their entire length. Groups of piles are joined together by pile caps where there are heavy concentrated loads and the whole of the main building area is covered by a low load-bearing reinforced concrete slab.

The main buildings, which are of steel-framed construction, are 140ft high by 226ft long and from the front of the c.w. pump house to the chimney is 360ft. The elevations of the main building show a composite cladding of brick and aluminium with straw-thatched bricks up to 38ft above ground level. The fluted aluminium sheeting is backed by a flat galvanised iron sheeting with glass fibre insulation between. All coal conveyors above ground level are clad with corrugated aluminium sheeting. The boiler house roof is of reinforced concrete cast *in situ*. The turbine house roof is of lightweight construction using pressed steel sheets covered with bituminised waterproofing.

The single reinforced concrete chimney is 350ft high with an internal diameter at the top of 14ft 6in. It is of circular section with 20 equally spaced vertical ribs and is capped at the top by a cast-iron section. The two reinforced concrete cooling towers, which were built by Film Cooling Towers, Ltd., are 286ft high with a pond diameter of 192ft. The shell is 8in thick at the bottom and 5in thick at the top. Reinforced concrete columns and beams, which are pre-stressed to 2,000 p.s.i., support the wooden stack which is chemically treated to prevent deterioration due to the action of the water. Above the stack there is an eliminator to prevent precipitation and the towers are also fitted with de-icing systems. Each tower will reduce the temperature of the circulating water by 16 deg F at the rate of 2¼ million gal/hr.

Coal Handling Plant

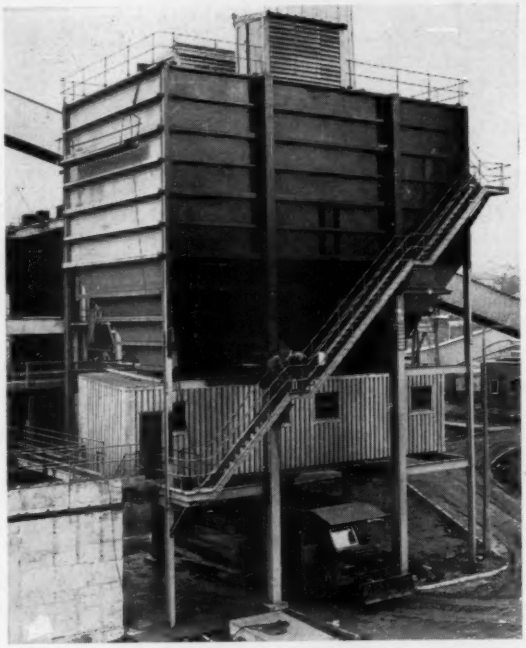
The station requires about 1,100 tons of coal per day when running at full load on a two-shift basis and this will normally be delivered by rail. No permanent arrangements have been made for unloading road-borne coal. As already mentioned, the British Railways main line runs immediately to the north of the station and coal sidings providing accommodation for 240 coal wagons have been built alongside it. The coal wagons are emptied by twin side tipplers supplied by Strachan & Henshaw, Ltd., each of which can handle up to twelve 24½ ton wagons per hour. These tipplers are designed so that any coal dust formed during the tippling process is trapped and returned to the tippler hopper. The coal wagons are weighed both full and empty by means of a weighbridge which is integral with the tippler.

Coal from the tippler hopper is discharged on to a single conveyor belt which takes it to a screening and crushing house where any large-sized coal is reduced to enable it to pass through a ¾in mesh. This coal is then conveyed either to the main station boiler bunker or to the storage area. Each boiler is provided with a single 800 tons maximum capacity bunker with four equal discharge sections, each of which feeds one pulverising mill.

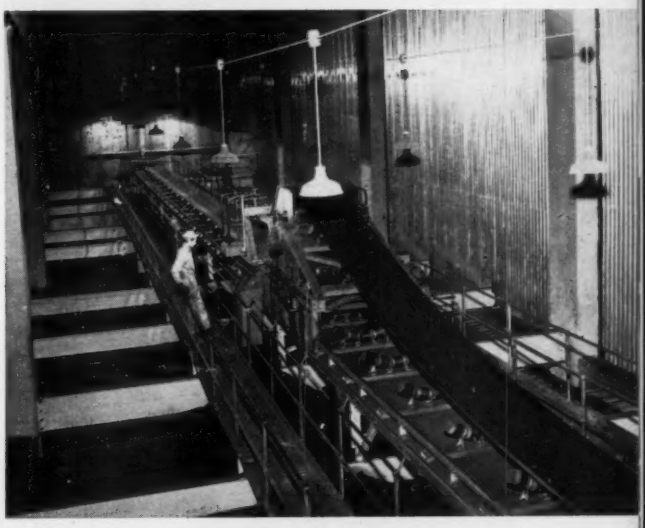
When stocking out to the storage area, coal is deposited

from a radial conveyor and spread over the stock by bulldozer. The coal store is semi-circular with a radius of 400ft and with coal stacked to a height of 12ft it provides storage for about three months' requirements. Reclamation of coal from stock is by bulldozer into underground hoppers at the edge of the storage area and then on to the conveyor system. All of the conveyors are 30in wide and have a capacity of 250 tons/hr with the exception of the reclaiming conveyor which has a capacity of 150 tons/hr. Coal which is sent to the station bunkers is weighed by a belt weigher and it is, therefore, possible to determine the weight of coal sent to or reclaimed from the stock.

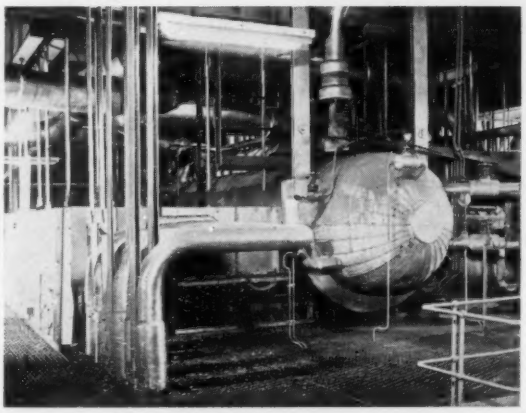
For each boiler there are four Babcock & Wilcox type E56 9½ tons/hr capacity pulverising mills, although any three mills can provide the necessary quantity of fuel to a boiler to enable it to run at full load. Each mill is driven by a 110 b.h.p., 590 r.p.m., L.D.C. motor. Coal from the bunkers passes to each mill hopper either directly or through an automatic Simon weigher as required, and is fed into the mill by a variable-speed rotary table feeder constructed integrally with the mill and driven by a 2½ b.h.p., 1,440 r.p.m., L.D.C. motor through a variable-speed gearbox. For each mill there is a Davidson primary air fan, the suction for which is taken from the main air ducts before and after the air heater and each is rated at 41,000 lb/hr at 27·5in w.g. The two suction tappings facilitate temperature control at the mill outlet. Each p.a. fan is driven by a 126 b.h.p., 1,470 r.p.m. L.D.C. motor. Each mill also has a Keith Blackman sealing air fan with



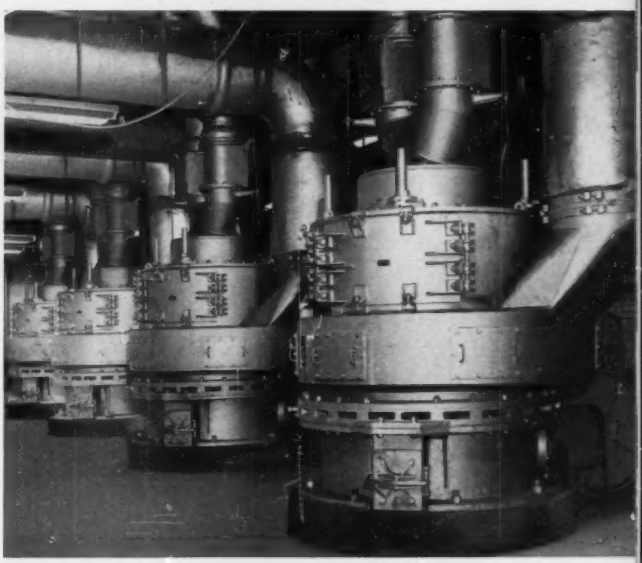
Dust hopper and mixer conveyors



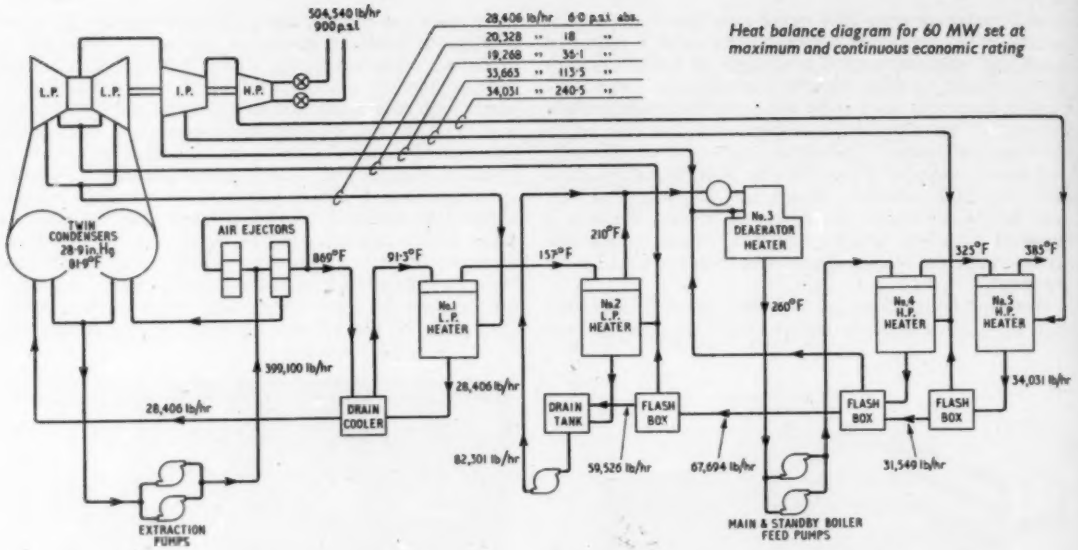
Coal conveyor system over bunkers



Steam and water boiler drum



Pulverising mills



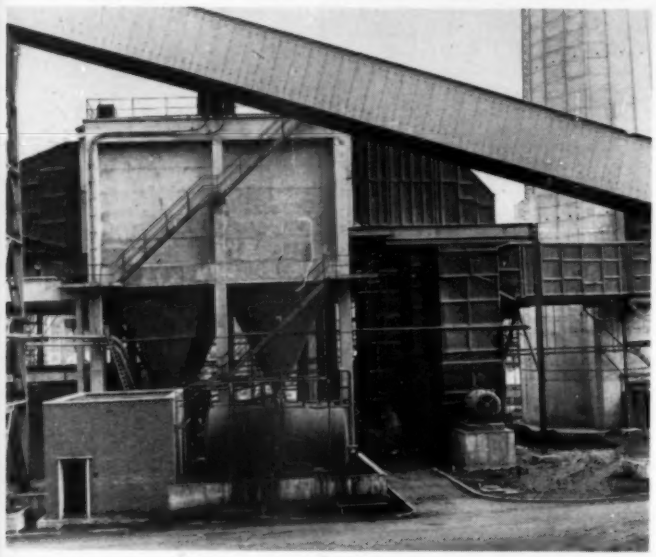
Heat balance diagram for 60 MW set at maximum and continuous economic rating

a capacity of 200 cu ft/min at 40in w.g. and 80 deg F air temperature. The four mills serve a total of sixteen vertical multi-tip inter-tube burners arranged eight in each side wall of the boiler. Each mill feeds a total of four burners, two in each side wall of the combustion chamber.

In addition to the p.f. burners, each boiler is fitted with eight retractable type oil lighting-up burners, four in each side wall, with pressure atomisers and automatic spark ignition. The fuel supply for these burners is obtained from two 20 ton storage tanks, each provided with three 4 kW immersion heaters. Two oil transfer pumps, two oil pressure pumps and a 132 kW oil heater have also been supplied for the station.

After combustion has taken place, the resultant ash falls into refractory-lined steel plate hoppers at the base of the furnace from which it is extracted by a Babcock & Wilcox

Precipitators, i.d. fan and fuel oil tanks



" Hydrojet " sluicing system and discharged into a single sluiceway running under the two boilers. Water for sluicing is provided by two 100 per cent duty sluicing pumps and the resultant ash/water mixture passes down the sluiceway and discharges into either of the twin settling chambers where the water is decanted and re-circulated. The ash is grabbed out of the settling chambers by means of a 5¼ tons capacity overhead travelling crane and is dumped on to a concrete apron to allow any remaining water to drain away.

Dust is removed from the precipitator hoppers by means of air slides which consist of porous asbestos/wire tiles in an enclosed duct arranged to have a slight downward slope. These tiles have compressed air beneath them which passes through the porous material to form a cushion on which the dust runs down the slide and into a collecting hopper. Dust which accumulates in the economiser, air heater and chimney hoppers is removed by compressed air blowers and discharges into the same hopper as the air slides. This hopper is emptied by means of a Fuller-Kinyon screw type pump which discharges under air pressure into the main dust bunkers adjacent to the ash settling pits.

Dust from the main bunker and ash from the drainage apron are loaded into tipping lorries and dumped on the land immediately to the east of the main station buildings. This land will eventually be built up to the level of the existing railway embankment and when this is completed, an area to the west of the station, but on the opposite side of the river, will be available for ash and dust disposal.

The station accommodates two Babcock & Wilcox radiant type single-drum boilers, each having a maximum rating of 550,000 lb/hr, the temperature and pressure of the steam at the superheater outlet being 950 p.s.i. and 925 deg F. The boiler is suspended from the main building steelwork so that all expansion takes place vertically downwards and no separate boiler supporting steelwork is provided. The chamber front and rear walls are of tangent tube construction, while the side walls are composed of studded tubes. The superheater is of the multi-loop type, the low-temperature portion being in two sections, one pendant and one horizontal, and the high-temperature section pendant. The superheater is divided into two sections, low-temperature primary and high-

temperature secondary, and between the primary and secondary sections a spray type desuperheater is fitted which automatically maintains the final steam temperature at 925 deg F ±15 deg F. Each boiler is furnished with a non-steaming economiser.

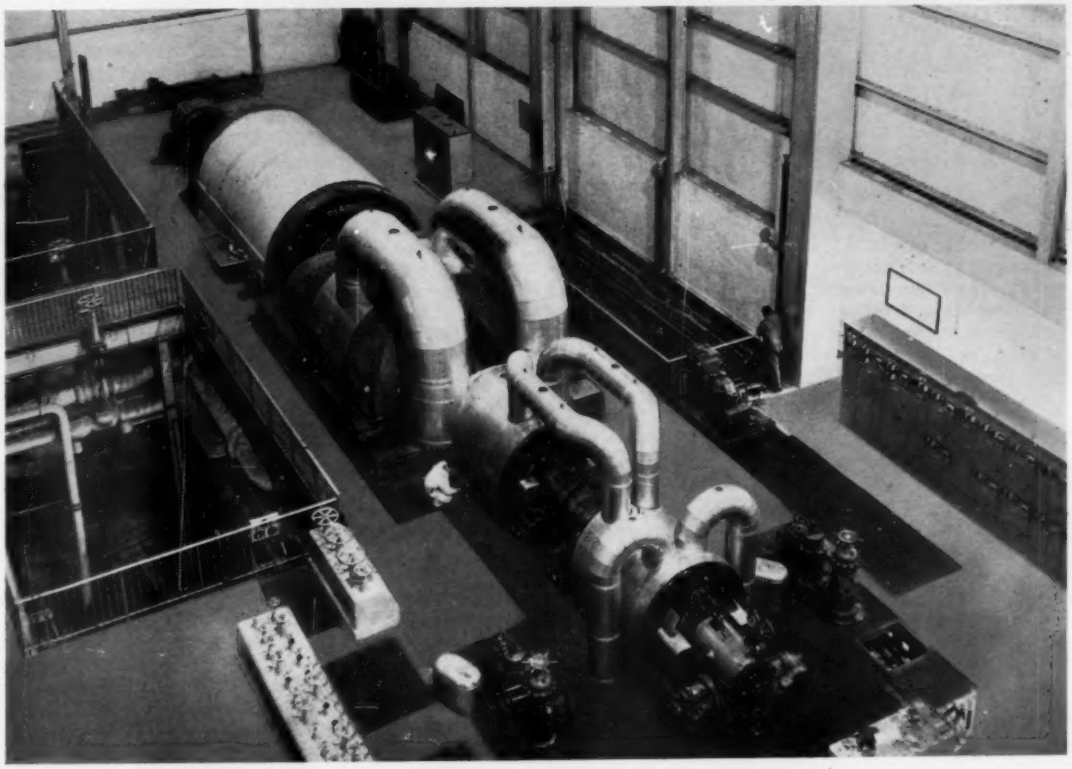
A Bailey system of steam temperature control is provided which takes into account total air flow, final steam temperature and interstage steam temperature. The spray water valve is positioned initially from air flow as an indication of boiler load with final readjustment from the steam temperature at one of the main steam outlets. An air loading pressure proportional to the interstage steam temperature modifies the final control pressure if the temperature at this point tends to deviate from that corresponding to the correct spray water supply for the boiler load. This also anticipates changes in final steam temperature and begins to make corrections before this is affected.

Two Davidson "Sirocco" forced draught fans, driven by 205 b.h.p., 740 r.p.m., 3·3 kV L.D.C. motors, are provided for each boiler. They draw warm air from above the boiler inside the boiler house and pass it through two Howden-Ljungstrom rotary air heaters, each with a total heating surface of 74,500 sq ft, and on into the furnace. Two Davidson induced draught fans, driven by 414 b.h.p., 741 r.p.m., 3·3 kV L.D.C. motors, extract the gases from each boiler and pass them through the Simon-Carves electrostatic precipitators which remove 97·5 per cent of the dust in the gas stream. Each precipitator is equipped with its own high tension house and metal rectifiers and is also arranged so that the elements can be changed while the precipitator unit is in service.

The boilers are equipped with automatic combustion control, and each boiler is connected to its respective turbine on the unit principle. Boiler control is carried out by means of an Electroflo pneumatic/hydraulic system. Variations in main steam pressure are sensed and transmitted to the f.d. and p.a. fan damper controls. Variations in f.d. alter combustion chamber pressure and this, in turn, controls the i.d. fan dampers to maintain the required suction. Fuel is fed to the p.f. mills by variable-speed table feeders, which are controlled by the p.a. fan and mill differentials. Thus, falling steam pressure calls for a higher combustion rate and provides (1) more f.d. for combustion, (2) an increased amount of primary air through the mills, and (3) an increased amount of i.d. to take away the products of combustion. The increased p.a. clears the mill of coal more rapidly, thus altering the differentials, and this change provides the extra fuel required to meet the new steam demand. Provision is made within the boiler control system for remote manual operation of all control dampers from the main control room.

The boiler is fitted with 40 sootblowers of three different types. Twelve Babcock electrically-operated single-nozzle blowers are used for the furnace walls, while the superheater is provided with fourteen "rack" type blowers. Six similar blowers are fitted to the economiser and eight unidirectional mass element blowers serve the two air heaters associated with each boiler. All soot blowers are electrically operated with sequence control which provides for automatic operation of each blower in its correct sequence either through the full blowing cycle or with the omission of any preselected units.

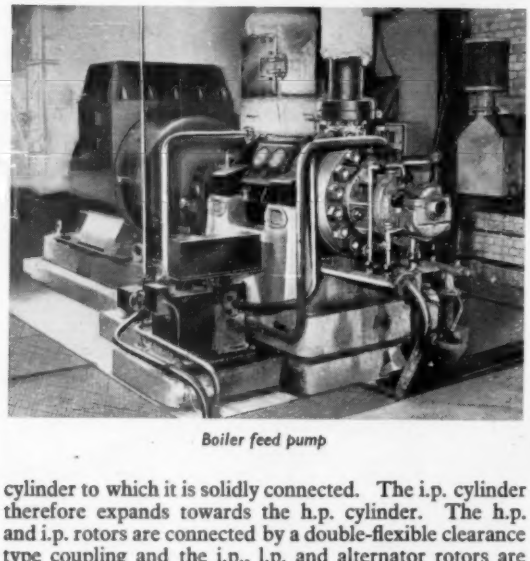
One of the two 60 MW Parsons turbo-alternators installed at Rogerstone



Individual operation is also possible and the sequence can be interrupted at any point and re-set. If during the sequence operation any blowing head fails to complete its operating cycle, the blowing system is interrupted and an alarm is sounded.

The steam leaves the boiler through a Dewrance electrically-operated stop valve and passes down twin ferritic chromium molybdenum alloy steam mains to the turbine stop valves. The two hydrogen-cooled Parsons turbines are designed to operate with steam conditions before the turbine stop valve of 900 p.s.i. and 900 deg F and to have an output of 60 MW at maximum and economic continuous rating. The turbines are three-cylinder and run at 3,000 r.p.m. Steam is bled in five stages for feed heating with a designed final feed temperature of 385 deg F. At a load of 60 MW with a final feed temperature of 385 deg F and an absolute back pressure of 1·1in Hg, the specified steam and heat consumptions are 8·435 lb/kWh and 9,211·4 B.Th.U./kWh respectively.

The cylinders are arranged in line. The h.p. cylinder is anchored at the exhaust end and the l.p. cylinder at the forward end adjoining the exhaust end of the i.p.



Boiler feed pump

cylinder to which it is solidly connected. The i.p. cylinder therefore expands towards the h.p. cylinder. The h.p. and i.p. rotors are connected by a double-flexible clearance type coupling and the i.p., l.p. and alternator rotors are solidly connected. Residual thrusts are catered for by thrust blocks, the thrust block fitted to the inlet end of the h.p. turbine being adjustable so that close axial clearances can be maintained under running conditions. The other thrust bearing is at the inlet end of the i.p. cylinder.

The main oil pump is gear driven by the h.p. shaft and supplies the governor relay system at 70 p.s.i. and lubricating oil at 20 p.s.i. when the turbine is running at speed. An a.c. motor-driven auxiliary oil pump is used during running-up, emergencies and shut-down periods and is arranged to cut in automatically at 8 p.s.i. In addition, a d.c. motor-driven emergency lubricating oil pump starts up automatically should both main and auxiliary oil pumps fail. An a.c. motor-driven oil pump is used for flushing the system during maintenance. A jacking oil pump is used in conjunction with the barring gear. Three 50 per cent oil coolers are installed for each set, using water as the cooling medium. The governor is a standard Parsons centrifugal type and is mounted at the opposite end of the cross-shaft which carries the main oil pump. There are two overspeed governors incorporated in a single unit which is bolted on to the outboard end of the h.p. turbine shaft. Unloading gear is provided to override the speed governor and to start to close the governor valves if the vacuum or stop valve pressure falls below a predetermined amount and an anti-motoring device is incorporated to prevent the valves closing completely should the vacuum or pressure continue to fall.

Under normal load conditions steam for sealing the turbine glands is taken from the exhaust of the h.p. cylinder. When starting up and under light load conditions, steam to glands is supplied from the auxiliary steam manifold through a reducing valve and a desuperheater.

There are two Parsons three-stage air ejectors and one quick-start air ejector for each turbine. The steam supply to the main ejector is desuperheated and throttled to 400 p.s.i. The desuperheating water is obtained from the main feed line after the h.p. heaters. The standby air ejector is designed for a nozzle steam pressure of 750 p.s.i. without desuperheating. The single-stage quick-starting steam jet exhauster is capable of raising a vacuum of 20in Hg in about five minutes and is designed for a steam pressure of 400 p.s.i.

Twin Parsons condensers, coupled on the steam side only by means of flexible bellows pipes, are of the surface type and have three passes. The total cooling surface is 57,000 sq ft and the normal total cooling water requirement is 37,500 gal/min. The tubes are expanded into the tube plate at the inlet ends and have packed glands at the outlet ends. Should the pressure in the condenser rise to ½ p.s.i. above atmosphere, an atmospheric exhaust valve operates. A high-water-level float alarm is provided with each condenser. The two 100 per cent duty, 750 gal/min, two-stage extraction pumps are driven by L.D.C. motors at 1,000 r.p.m.

The extraction pump delivers the condensate through the air ejectors, drain cooler, two l.p. heaters and de-aerator vent condenser to the l.p. de-aerator heater which is mounted on an enclosed storage tank. The boiler feed pump takes feed water from this storage tank and delivers it through two h.p. heaters to the boiler. All heaters are of Parsons manufacture except the de-aerator heater which was made by Wm. Boby & Co., Ltd. The de-aerator heater is of the direct-contact type and is vented either to the main condenser during starting up or to atmosphere when on load through a vent condenser which is cooled by the incoming feed water. The de-aerator storage tank has a capacity equal to the maximum load steam consumption for ten to fifteen minutes and is fitted with level-controlled valves and high and low level alarms.

Each of the three 100 per cent duty motor-driven boiler feed pumps has a capacity of 650,000 lb/hr with a discharge pressure of 1,150 p.s.i. There is one pump per unit and the pumps are interconnected so that the third pump provides standby for either of the other two.

The boiler feed consists of turbine condensate and about 2½ per cent of treated town water. This make-up water is obtained from a Permutit "Deminrolit" plant arranged in duplicate and each half has a capacity of 4,300 gal/hr.

A total of 4 million gal/hr of cooling water is required by both turbines to condense the exhaust. The minimum flow of the River Ebbw is insufficient to meet this requirement and two 2¼ million gal/hr cooling towers have been constructed.

Two 20,000 gal/min Mather & Platt circulating water pumps per machine are driven by 440 h.p., 3·3 kV motors, and draw water from the cooling tower ponds and discharge into the condenser inlet main through Blake-

borough hydraulically-operated non-return valves. These valves are held open by oil pressure under a piston against a dead load of 10 tons applied to the valve. Should the circulating water pump trip out, the oil pressure will be by-passed to the tank and the valve closed by the dead weight. Three 50 per cent duty 1,240 gal/min circulating water system make-up pumps are installed in a pump house on the bank of the River Ebbw. These pumps are controlled by pH meter equipment which cuts out the pumps when the river water is below a pH of 6·5. The river water requires treatment before it can be used as make-up. The water is injected with a mixture of ferrous sulphate and lime to promote flocculation before entering the clarifying tanks. Six clarifying tanks have been installed. Sludge is removed from the bottom of the tanks by a pump and is disposed of with the ash and dust.

The 60 MW, 11·8 kV, hydrogen-cooled alternators and the gear-driven, air-cooled exciters are of Parsons manufacture. Circulation of both hydrogen and air is by means of fans mounted integral with the rotor and exciter shafts. The hydrogen is cooled by four distilled water coolers situated in the stator casing and the distilled water is cooled by external circulating water coolers. The hydrogen cooling system is completely enclosed in the fabricated steel stator casing which is gastight and designed to withstand an internal explosive pressure. The ends of the stator casing are enclosed by cast steel end covers and the hydrogen is prevented from escaping around the rotor shaft by oil film seals. The oil pressure at the seals is maintained at 5 to 7 p.s.i. above the gas pressure in the stator casing which is 15 p.s.i. under normal operation.

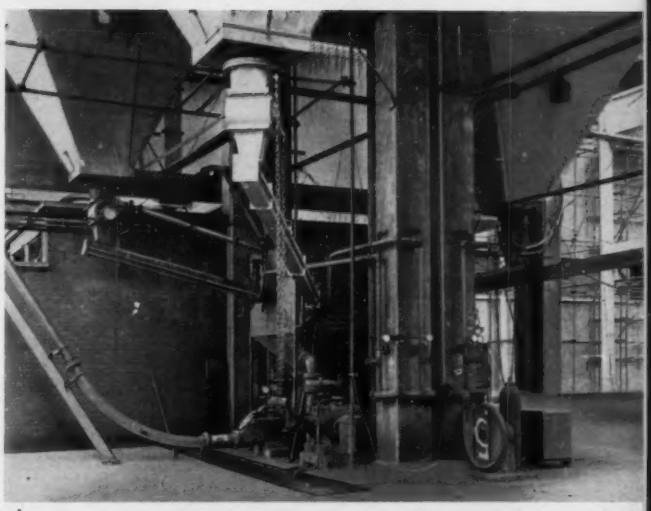
The exciter is gear driven at 1,000 r.p.m. and comprises an exciter and pilot exciter on the main shaft. Excitation control is by a motor-driven rheostat in the field of the main exciter. A Metrovick automatic voltage regulator is fitted to each alternator.

A 60 ton overhead travelling crane with an auxiliary hoist of 10 tons is provided in the turbine house for lifting all major items of plant with the exception of alternator stators. For off-loading and installing the alternator stators a mobile lifting gantry was used.

Electrical Connections

Each alternator is solidly connected to a 75 MVA, 11·8/66 kV generator transformer. There are no unit transformers. The generator transformers are forced-oil air-blast-cooled in two sections with on-load tap-changing. Solid copper connections in air-conditioned trunking are installed between the alternators and the l.v. side of the transformers. The h.v. side of the transformers is connected to the 66 kV substation English Electric circuit-breakers. The outdoor substation, which has a U-shaped main busbar with a reserve busbar in the centre, has fourteen 1,500 MVA bulk oil circuit-breakers. Two of the nine outgoing overhead lines feed into the 132 kV substation at Llantarnam and one into the 66 kV system at Upper Boat and six are for the Area Board distribution system.

Two 7·5 MVA, 66/3·3 kV transformers are installed to supply the 3·3 kV station switchboards. Two 1·5 MVA, 3·3 kV/415 V transformers supply the low-voltage auxiliary equipment. The 3·3 kV, 150 MVA air-break switchgear is of English Electric manufacture and the



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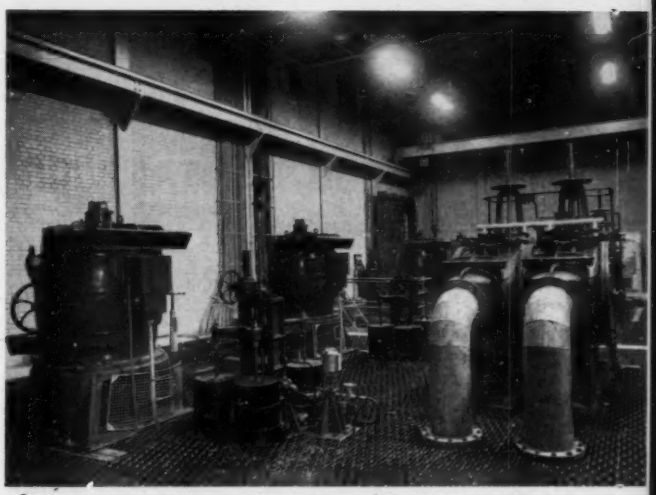

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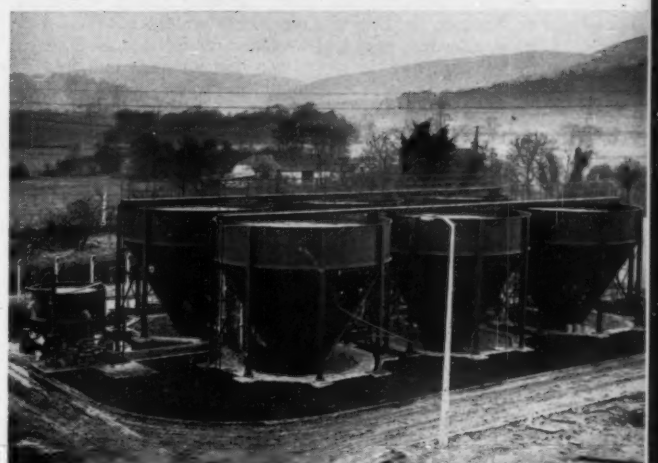

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1. Fuller-Kinyon screw type pumps which discharge dust from the precipitator hoppers into the main dust bunkers. The air-slide can be seen above the pumps. 2. Circulating water pump house. 3. Circulating water make-up settling tanks

Central control room; the electrical control panel is shown on the right

415 V supplies are distributed through Watford Electric contactor switchgear, English Electric air-break switchgear and combination fuse-switch units. A 100 kW diesel alternator set is provided for emergency supplies to the battery charging, emergency lighting, barring gears and h.p. oil pumps.

Central Control Room

The station control room is situated on the centre line of the station between the turbines and boilers. It is fully soundproofed with cavity walls, double glass windows and revolving doors. Air-conditioning plant is installed. Unit control panels for boilers and turbines are provided. All electric loading of the turbo-alternators and the switching of the 66 kV substation is carried out from this room. In addition, there is a panel for the supervisory control of the unmanned Llantarnam substation. A central alarm panel has provision for approximately 364 alarms.

The main consulting engineers for the station are Kennedy & Donkin and the civil consultants are Sir Bruce White, Wolfe, Barry & Partners. The main contractors are:—Foundation and buildings, Sir Robert McAlpine & Sons (South Wales), Ltd.; boilers, Babcock & Wilcox, Ltd.; turbine and condensing plant, C. A. Parsons & Co., Ltd.; coal handling plant, Simon-Carves, Ltd.; 66 kV and 3·3 kV switchgear, English Electric Co., Ltd.; generator transformers, C. A. Parsons & Co., Ltd.; station transformers, British Thomson-Houston Co., Ltd.

Acknowledgment is due to Mr. W. Wilde, Controller, South Wales Division, C.E.G.B., for permission to publish this article.

METROPOLITAN-VICKERS SUMMER SCHOOL

LAST week a summer school for professors and heads of departments in engineering, physics and metallurgy was held by the Metropolitan-Vickers Electrical Co. at Trafford Park, Manchester. This was the seventh in the series of schools held by the company since 1928 which had brought together professors, lecturers, headmasters and career masters to present to them the scientific and technical developments which are taking place. The programme combined lectures and discussions with tours of the works.

The proceedings opened with a reception and dinner on the Monday evening with Dr. Cecil Dannatt, managing director, in the chair. Mr. H. West, director, electrical engineering, proposed the toast of the guests and recommended that more emphasis should be placed on teaching the English language to undergraduates. Dr. B. V. Bowden, principal, Manchester College of Science and Technology, in reply, said that all were indebted to the company for the amount of capital spent on engineering education. Professor M. W. Humphrey Davies proposed the toast of the Metropolitan-Vickers Electrical Co. and the chairman responded.

The first session of the school was devoted to the organisation of the company and apprentice training schemes. The various technical lectures given ranged from "Light Current Developments" to "Large Slow-Speed Generators and Motors." In his lecture on Tuesday afternoon Mr. J. S. Hall, chief engineer, Steam Turbine Department, gave a resumé of the latest developments with regard to steam turbines. Unit sizes had increased, with a consequent reduction in cost per kW stored. Steam flow had been reduced by approximately 17 per cent by the use of the reheat cycle. Rigid coupling of rotors was a major post-war development.

Large electrical machines were discussed by Mr. C. P. Holder on Wednesday. The last five years had seen a steep increase in the size of hydro-electric generating units from about 30 MW to 138 MW. This had necessitated special developments in the fabrication of large structural parts, in the design and manufacture of armature and field windings, in ventilation and in the design of thrust and guide bearings. The principal development in the d.c. machine field had been in the application of rolling mill drives where unusually low inertia was required.

The use of hydrogen and water for cooling large turbo-generators was described in a lecture by Mr. W. N. Kilner, divisional chief electrical engineer. Mr. F. Whyman, chief engineer, Traction Division, commented on the different systems of electrification in the light of present-day developments in electric traction. Six departments of Metropolitan-Vickers are primarily engaged in the light current field and a survey of recent developments was given by Dr. L. W. Brown, assistant chief electrical engineer, light current.

On Thursday morning Mr. S. A. Ghalib, chief engineer, A.E.I.–John Thompson Nuclear Energy Co., gave a discourse on the design of nuclear power stations with particular reference to Berkeley power station and he was followed by Dr. T. Raine who described the work of the metallurgist in the field of nuclear engineering. Mr. E. R. Hartill, of the Transformer Engineering Department, then gave a most interesting talk on "Zeta" and described in some detail the construction of the large pulse transformer forming the major part of this apparatus. In the afternoon Mr. C. H. Flurscheim dealt with some of the mechanical problems involved in the design of electrical equipment. Sir Willis Jackson, director of research and education, then gave a talk on graduate and associated studies. On the final day Dr. R. W. Sillars and Mr. S. Neville spoke on insulating and electromagnetic problems respectively.

Engineering Production in Europe

O.E.E.C. STUDY OF CONTINUING EXPANSION

THE years since the war have been a period of remarkable prosperity for the engineering industry of Western Europe. It is true that from 1956 the pace of expansion has slackened, owing to credit and other Government restrictions and to the effects of the American recession, but both capacity and output have continued to increase at a healthy rate. The economic trends and their causes during this period of change from boom to more normal conditions are the subject of an exhaustive study made by the machinery committee of O.E.E.C. and called "The Engineering Industries of Europe" (price 12s 6d). The report is based on detailed commentaries and statistical information supplied by Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Sweden, Switzerland and the United Kingdom, which, taken together, account for practically the total production of engineering goods in member countries of O.E.E.C. The committee consider that development over the past three years has been satisfactory and that the overall demand for European engineering products will call for a further rise in production. The industry's ability to meet the demand will depend on the maintenance of a high level of investment and the overcoming of the common problems presented by the shortage of qualified workers and technical staff, and those of rising costs of labour and materials.

Increase in Output

Between 1953 and the end of 1956 the engineering industry of Western Europe (i.e. of the O.E.E.C. countries) increased its delivery of goods by 36 per cent. The most rapid expansion in deliveries was in 1955 (14 per cent); in 1957 it had eased to 8 per cent. Total deliveries of engineering products in 1956 were over $35 billion, of which 70 per cent was sold in domestic markets, 12 per cent exported to other O.E.E.C. countries and 18 per cent exported to non-member countries.

Since 1953 prices of engineering products have increased by about 5 per cent, and taking this into consideration it is estimated that the production of the European engineering industry was 40 per cent higher in 1957 than in 1953. Over the same period the engineering industry of the United States increased its output by only 8 per cent. Until 1955 production of durable consumer goods in Europe expanded at a steeper rate than capital goods. But in the following year the position was reversed due to Government controls and the effects of Suez. In 1957 consumer goods resumed expansion and capital goods also continued their steady increase.

The share of electrical machinery, apparatus and appliances in the total deliveries rose from 20·4 per cent in 1953 to 22·9 per cent in the second half of 1956. At $7,926 million, deliveries of electrical engineering products in 1956 were nearly half as high again as in 1953. The rate of expansion in deliveries dropped from a maximum of 19 per cent in 1954-55 to 8 per cent in 1956, mainly owing to a much reduced rise in production of durable consumer goods (mainly domestic appliances) which form a substantial part (20 per cent) of the total deliveries of this branch. Electric durable consumer goods showed a sharp rise in output in most countries in 1957. Between 1954 and 1956, Intra-European electrical exports (nearly 10 per cent of total output in 1956) expanded at a somewhat steeper rate than output and of both shipments to non-O.E.E.C. countries (22-33 per cent of total output) and deliveries in the manufacturers' own countries.

Employment in the engineering industry increased steadily up to the second half of 1956, but in 1957 there were indications of a reduced demand for manpower in some branches. A feature of the industry, and electrical engineering in particular, has been the comparatively larger increase in the number of salaried employees, a consequence, it is suggested, of the progress of mechanisation in production and the growing volume of research and development work.

In general, production capacity has been well used and in most cases the factors responsible for spare capacity have been outside the influence of the industry concerned. There has been a further improvement in productivity as a result of continued weighty investment in more efficient processing equipment and mechanisation.

Imports and Internal Demand

When price increases are taken into account it appears that the growth of engineering imports by member countries from outside Europe has been of the same order as the expansion in their industrial activities; in recent years, these imports have been steady at about 3 per cent of total deliveries. That is not to say that they could easily be replaced by home products since about four-fifths of the total imports represent specialised capital goods from the United States and Canada. It is significant that imports from outside Europe are of less importance to the Common Market countries than to the remaining members of O.E.E.C.

In recent years the trends of the internal demand of member countries have differed quite substantially from the demand from outside Europe. As a consequence the share of exports in total demand, after declining from 1952 to 1954, increased in 1955 and 1956. However, for electrical goods the share in 1956 was still slightly smaller than in 1952. With the exception of the United Kingdom where a small diminution was recorded, total demand for engineering products increased between 1955 and 1956 in all producer countries.

The internal demand for durable consumer goods since 1955 has continued to be influenced by the same factors (purchasing power, purchasing conditions, etc.) as previously but in the last two years Government restrictions have assumed a greater importance. The levelling off in the total consumption of consumer durables in 1955 (then 40 per cent higher than in 1953) was largely due to the United Kingdom's efforts to restrict demand, since expenditure on these goods in other countries continued to rise. The report also draws attention to the fact that expenditure on consumer durables grew considerably faster than total private consumption. In periods of increasing personal incomes, the growth of total expenditure on durable consumer goods is due not only to the general spreading of demand but also to the shift upwards in demand from lower to higher grade goods. It seems reasonable to assume that if total private consumption continues to increase, a further substantial rise in the purchases of consumer durables will follow.

As has been mentioned, since 1955 engineering exports from Western Europe expanded more quickly than home demand. In 1956 extra-European exports represented nearly 17 per cent of the total apparent demand and they were far the highest (24 per cent) for the United Kingdom. Electrical machinery formed 18 per cent of the total extra-European exports, and over 80 per cent of the total was directed to the less industrialised countries. The basic trends affecting export demand are therefore to be found in the pressure in these countries towards increased industrialisation and the extent to which they have suffered from the fall in world commodity prices. The recent decline in the flow of new orders is considered as a return to normal but, due to the expansion in output, orders in hand at the end of 1957 represented a smaller reserve of work.

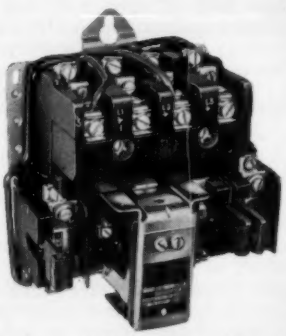
Between 1953 and 1956 engineering exports from Europe to North America increased by 60 per cent and those to other dollar area countries by only 14 per cent. The United Kingdom and Germany were by far the largest exporters but all O.E.E.C. countries increased their dollar exports substantially except France and Denmark. It is also noteworthy that engineering exports to the dollar area expanded nearly twice as quickly as exports of all other goods. During the same period exports to East European countries expanded by over 50 per cent, and there was a 60 per cent expansion in intra-European trade in electrical equipment.

In 1955 over 7·7 million people were employed in about 57,000 engineering establishments in the eleven European producer countries. There were approximately 1,300 large plants (employing 1,000 persons or more) and less then 10,000 medium sized firms; all other plants had less than 100 employees on their payrolls. The large plants accounted for over 45 per cent of the manpower and medium sized plants for 40 per cent. In most countries the greatest number of plants produce "machinery, other than electric" but in all countries the electrical engineering and transport engineering plants are on the average larger than other engineering plants.

NEW INSULATING MATERIAL

AN arc-resistant electrical insulating material which combines the desirable features of both ceramic and plastic insulators is now being marketed in Great Britain under the trade name of "Rosite." It is described as "moulded stone" and prominent American companies of international repute have adopted the material for use in various components. Manufacturing and marketing facilities have been set up with headquarters at Rosite, Ltd., Cheney Manor, Swindon, and the Cheney Manor factory is already meeting the specific requirements of an American switchgear manufacturer now established in Great Britain.

Chemically, "Rosite" is an inorganic calcium alumino silicate, which is compounded in moist powder form from basic materials that are readily available and comparatively inexpensive to produce. The basic manufacturing principle is that of cold moulding. Hardened steel dies are employed and the material is subjected to pressures of between 6,000 and 10,000 p.s.i. Normally, single-cavity, rapid action dies are used, although mouldings can be made in multiple cavities where the type of application and costs justify their introduction. After removal from the mould, each part is cured by subjecting it to high-pressure live steam for a short period. For electrical applications, parts are subsequently baked and may be impregnated with moisture-proofing waxes to maintain their dielectric strength. During the moulding process, metal inserts may be positioned where required.



Square D starter incorporating "Rosite" components

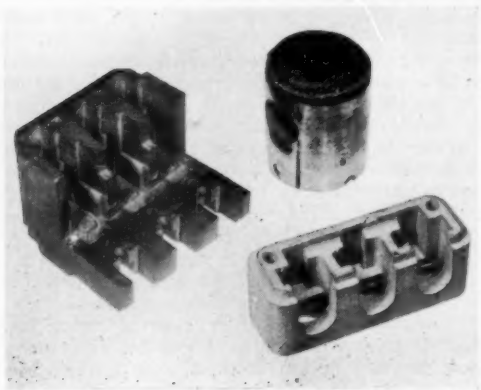
The advantages claimed for the new material include the combination of several factors considered necessary for effective insulation. Important among these are excellent arc resistance and heat resistance (up to 900 deg F), together with low tracking characteristics. "Rosite" maintains very high dimensional stability with a moulding accuracy of ±0·003in to ±0·005in per in. With these close tolerances the bulk of normal machining costs is eliminated.

Dielectric strength is given as 50-80 V per 0·001in, dependent on the different compositions of the compound. Ageing and cold flow are not experienced in the material, and water absorption on 24-hr immersion is 0·5 per cent to 1 per cent.

When machining of "Rosite" components is necessary, it can be carried out using carbide-tipped tools and the material will also support self-tapping screws.

A technical research laboratory is being set up at Cheney Manor, and facilities will be available for making models, moulds, dies, etc., thus offering a comprehensive service to industry generally. The plant and equipment already in operation at the new Swindon factory provides for the bulk production of both small and large components.

"Rosite" components. A lined metal tube for a welding electrode holder nose is shown at the top right with a contactor base at the left and a terminal block at the lower right



VIEWS on the NEWS

By REFLECTOR

REFERRING to my note on Sir Oliver Lodge's work on high-voltage discharge over growing crops, Mr. C. A. Cameron Brown, Agricultural Electrification Adviser to the Electricity Council, sends the following interesting reminiscence:—

"At my earliest introduction to Rothamsted in the mid-20's I saw on some of the fields the remains of a most imposing network of posts and wires which I found on inquiry to have been the equipment for an experiment to determine whether these early favourable results achieved by Sir Oliver, and others, were really in fact practicable gains which could be put into use in farming.

"I cannot find my own report on the work, if ever I had one, and I am afraid that I cannot face the task of digging it out of the Ministry's archives. However, my recollection of the findings of the Rothamsted work is that, while gains, even of the order mentioned by "Reflector," were found, there were equal losses in other years and that, by and large, the fluctuations were no more than one would expect from normal seasonal and climatic conditions.

"I might add, too, that one particular proprietary method of applying the process involved one overhead wire and a corresponding and parallel sunken wire in the soil. While reasonable results appeared to be obtained from this method, it was eventually concluded that the main factor was the double digging and the particularly good cultivation brought about by the burying of the lower wire."

* * *

It was stated at a recent meeting of Manchester City Council that the Minister of Education had hampered the city's plans for cleaner air by refusing to allow the extra cost of installing electric heating in the new Domestic and Trades College, which would now have coke-fired boilers. Commenting on this the *Manchester Evening News* says "Of course it costs more to be clean than to be dirty, but the gain to future generations is priceless." That premise is too often taken for granted. A week or two ago I mentioned a case in which revised figures for a heating installation, covering all the costs involved, reversed the position in favour of electricity. In the Manchester scheme there is a considerable disparity between the costs given for electricity and solid fuel. Alderman R. S. Harper expressed the view that electric heating had been disallowed because it had been included "as a kind of afterthought," when the estimates had been submitted for Ministry approval. Heating installations are all too commonly relegated to that position in this country.

* * *

Not much is heard these days about the "Non-Stats"—non-statutory undertakings of which, before nationalisation, there were more than 300 in existence. An entertaining account of the activities of these private supply undertakings is given by Mr. T. R. Smith, A.M.I.E.E., assistant chief commercial officer of the Merseyside and North Wales Electricity Board, in the July issue of *Contact*. I was interested to learn that there are still a number of "Non-Stats" who continue to supply hamlets and villages remote from the Board's mains and Mr. Smith pays a tribute to their "high sense of duty and responsibility in providing the added amenity of a good, or sometimes not so good, supply of electricity for their friends and neighbours." Some of the distribution systems of the former undertakings were not all they might have been and the writer refers to "the apparently insecure low voltage efforts which would be seen hung on trees, using old insulators discarded by the G.P.O. and glass bottle-necks." He goes on to say:—

"Notwithstanding these curiosities, however, it was a source of never-ending wonder that throughout heavy gales which raged in the winter, the conductors and frequently the poles swayed and creaked in the wind, but still the supply continued to be available. The engineers of the Power Company often thought that the conductors in many cases were supporting the poles instead of vice versa. This actually turned out to be the case in one instance where the Board had erected a new distribution system. During the course of dismantling the old system, a linesman cut the binders on the pole insulators, and the pole fell down, unfortunately injuring him. Thereafter greater precautions were taken."

* * *

I was pleased to see the importance of good lighting brought home to viewers in last week's B.B.C. television programme "Facts and Figures," which dealt with accidents of various kinds. One thing that impressed me was that, contrary to the belief sometimes held, even poor lighting is better than no lighting at all. Dealing with road accidents, it was shown that, taking the risk in daylight as 1, at night with good lighting the figure was 2·5; with average lighting 3·4; with poor lighting 3·7; and with no lighting at all 4.

* * *

In the *Electrical Review* sixty years ago (22nd July, 1898) there appeared a note under the heading of "Petroff or Sir Humphry Davy?" referring to a claim that a Russian professor, Vassili Petroff, and not Sir Humphry Davy, had been the first to discover the electric arc. The claim was discussed at greater length in the following week's issue when extracts were published from a letter by Davy in 1800 and from an account of experiments in galvanic electricity in the *Journal* of the Royal Institution of 1802. The *Review* commented:—

"Many electricians will be surprised to hear that in several old and modern English books there is no mention of the discovery of the electric light by Sir Humphry Davy, and that in the French books, Du Moncel, *l'Eclairage Electrique*, by Alglave and Boulard, the first experiments by Sir Humphry Davy are represented as having taken place in 1813. Evidently, the Russian writer, under the impression that the information given by Du Moncel and others was correct, and having heard of the experiments made by Petroff, who may have repeated at the end of 1802 the ones made by Davy several months before at the Royal Institution, jumped to the conclusion that it was his countryman who had discovered the electric arc. *Errare humanum est* !"

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. J. B. Higham, Ph.D., B.Sc., A.M.I.E.E., has been appointed to the new post of head of technical development by Pilkington Brothers, Ltd. He will be responsible for the creation of a centralised department to co-ordinate and expand technical development in all the company's works. Dr. Higham joined Pilkington Brothers' Research Department in 1956. Before that he was a lecturer in electrical engineering at Birmingham University for eight years, and also held a research fellowship at Liverpool University. Last year he was elected to the Council of the Institution of Electrical Engineers.

Mr. A. W. Field, B.Sc., F.B.I.M., A.M.I.Mech.E., has been appointed deputy managing director of Mawdsley's, Ltd., Dursley. He joined the company twelve years ago as general works manager, having previously been a management consultant for many years.

Mr. J. Strong, M.A., executive director of British Oxygen Gases, Ltd., has been elected president of the Institute of Welding for 1958-59 in succession to Sir Charles Lillicrap, K.C.B., M.B.E.

Mr. A. W. A. Dick-Cleland has relinquished his position as director of Lancashire Dynamo Holdings, Ltd., and managing director of Lancashire Dynamo & Crypto, Ltd., one of its subsidiaries. He has been joint managing director of Lancashire Dynamo & Crypto, Ltd., since 1951.

At an investiture at Buckingham Palace on 15th July, **Dr. Willis Jackson,** Director of research and education, Metropolitan-Vickers Electrical Co., Ltd., was knighted by the Duke of Edinburgh. The knighthood was conferred upon Dr. Willis Jackson in the Birthday Honours. He was accompanied by his wife and his mother, Mrs. A. Jackson.

Sir Willis Jackson at Buckingham Palace after being knighted by the Duke of Edinburgh. Mrs. A. Jackson (his mother) is on the left, and Lady Jackson on the right

Mr. E. D. Regis, experimental engineer at the Willesden Switchgear Works of the British Thomson-Houston Co., Ltd., retired on 14th July after more than forty-three years' service with the company. Educated at Stafford Technical College and the South Western Polytechnic, London, Mr. Regis served an apprenticeship with Siemens Brothers Dynamo Works (now English Electric), Stafford, and joined the engineering staff of the B.T.H. Co., Willesden, in 1914. After working on large contracts connected with the Dunston and Carville power stations of the old Newcastle Electricity Supply Co. and gaining experience as a section leader handling small a.c. and d.c. switchboards, he was, in 1924, given control of a newly formed section concerned with the development of new designs of oil circuit-breakers and metalclad switchgear. Several years later Mr. Regis was appointed design engineer with responsibility for the full range of metalclad designs. In this capacity he was the author of numerous patents affecting switchgear design. As a result of the company's expansion Mr. Regis was, just before the last war, appointed experimental engineer, a position which, together with that of liaison engineer on patents, he held until his retirement.

Mr. E. D. Regis

Mr. G. Collyer

Mr. G. Collyer, M.C., A.M.I.E.E., personal assistant to the manager of switchgear contracts of the British Thomson-Houston Co., Ltd., Willesden, retired on 16th July last after forty-seven years' service with the company.

He received his technical training at London Polytechnic and Rugby College of Technology. After serving an engineering apprenticeship and gaining general experience in hydro-electrical and metallurgical engineering with the British Aluminium Co., Ltd., he entered the service of the B.T.H. Co., serving in the Test Department at Rugby Works from 1911 until 1915. For a short period he was complaints engineer at the company's Glasgow office and after war service he joined the Manchester office as assistant district construction engineer. In 1922 he was transferred to the Construction Department, Rugby, and three years later he was appointed to take charge of switchgear contracts business for Sheffield and South Wales. Later, he was for many years responsible for switchgear sales business for the London area. He has been personal assistant to the manager of switchgear contracts since 1956.

Mr. L. Phillips, senior assistant engineer (sales department) to the Merseyside and North Wales Electricity Board, has been appointed as senior assistant engineer (commercial) of the Eastern Electricity Board in the Essex Sub-Area. Mr. Phillips will be based at Brentwood and he will take up his new duties early in August. Before joining M.A.N.W.E.B. in 1955 Mr. Phillips held posts in the Eastern Electricity Board at the Ipswich headquarters and as manager at Braintree, Essex. Previous to this he was with the Edmundsons Electricity Corporation, holding various appointments in their Eastern Group.

We regret that in publishing the portraits of the new officers of the Institution of Electrical Engineers for the 1958-59 session in our last issue we inadvertently reproduced the portrait of Mr. A. N. Irens instead of that of **Mr. H. V. Pugh,** who has been elected to the Council of the Institution. We now reproduce Mr. Pugh's portrait.

Mr. H. V. Pugh

Mr. J. Buck, A.M.I.E.E., deputy power station superintendent at Stella South power station, North Eastern Division, C.E.G.B., has been appointed superintendent. He received his tech-

Mr. J. Buck

Mr. R. H. Murfitt

Mr. A. Sherry

nical education at Rutherford and Darlington Technical Colleges and served an apprenticeship with the London and North Eastern Railway. In 1939 he joined the North Eastern Electric Supply Co., Ltd., serving in substations in the Tyneside area. He moved to North Tees "A" and "B" power stations in 1940 and later held appointments at Horden power station and in the economy section at Carliol House. On vesting day he was a shift charge engineer at North Tees "A" and "B" power stations, and was appointed operating and efficiency engineer at the same station in 1951 after brief periods at Middlesbrough and Scarborough power stations. Subsequently he was appointed deputy power station superintendent at Carville, moving soon afterwards to Stella South in the same capacity.

Mr. R. H. Murfitt, A.M.I.E.E., A.M.I.Mech.E., Assoc.Brit.I.R.E., senior assistant engineer, Generation (Operation) Department, has been appointed deputy superintendent at Stella South power station. Mr. Murfitt received his technical education at Wakefield College of Technology. In 1945, after completing an engineering cadetship in mechanical and electrical engineering, he was commissioned in the R.E.M.E. and was subsequently appointed to the Signals Research and Development Establishment of the Ministry of Supply. After demobilisation he joined the staff of the North Eastern Division of the British Electricity Authority. Following a short period as shift control engineer at Carville power station, he became assistant engineer in the Generation (Operation) Department, subsequently becoming senior assistant engineer in that department.

Mr. A. Sherry, M.Sc., A.M.I.E.E., A.M.I.Mech.E., who since 1954 has been operating and efficiency engineer at Stella South power station, has been appointed deputy power station superintendent at Blyth "A" and "B" power stations of the North Eastern Division of the C.E.G.B. Mr. Sherry served an apprenticeship with Telephone Rentals, Ltd., and was with the National Coal Board on National Service from 1945-48. In 1948 he was appointed shift control engineer at Carville power station and later that year moved to Dunston "A" power station. In 1951 he was promoted to general assistant engineer, becoming third assistant engineer in 1952.

In recognition of distinguished engineering achievements in Australia, the chairman of the State Electricity Commission of Victoria, **Mr. Willis H. Connolly,** has been awarded the Kernot Memorial Medal for 1957. The award was presented by Professor Sir Leslie Martin, Professor of Physics and Pro-Vice-Chancellor of the University of Melbourne.

Mr. W. E. Guidott, F.C.I.S., F.A.C.C.A., has been appointed secretary to the Croydon and West Kent Sub-Area of the South Eastern Electricity Board in succession to Mr. F. G. Beeby, whose retirement was announced in our 11th July issue. With this appointment Mr. Guidott rejoins "Seeboard" after five years with the Central Electricity Authority and the Electricity Council. Up to 1953 he had been employed at the Board's headquarters at Hove.

Mr. W. E. Guidott

Mr. Guidott was educated at Brighton Grammar School and began his career with a firm of professional accountants in Brighton. In 1934 he was appointed local accountant to the Ringmer and District Electricity Co., Ltd., and about six years later became principal accountancy and administrative assistant in the Electricity Department at High Wycombe. He joined Dover Corporation in 1945 as secretary in the Electricity Department and, on nationalisation of electricity supply, took up a secretarial appointment with "Seeboard" at its headquarters. In addition to his duties as sub-area secretary, Mr. Guidott becomes secretary of the Croydon and West Kent District Committee of the South Eastern Electricity Consultative Council.

British Railways (London Midland Region) announces that new responsibilities have been taken over by **Mr. J. F. Harrison,** M.I.Mech.E., M.I.Loco.E., chief mechanical and electrical engineer, who now assumes responsibility for the overall direction of all the mechanical and electrical engineering work of the Region, including the Chief Mechanical and Electrical Engineer's Department and the Carriage and Wagon Engineer's Department as well as the technical aspects of the Motive Power and Road Motor Engineer Departments. In order to enable him to administer effectively this increased range of responsibilities Mr. Harrison is to make his headquarters at Euston.

Mr. J. C. Swallow, Ph.D., B.Sc., A.M.I.Chem.E., F.R.I.C., F.P.I., has been elected president of the Plastics Institute and **Mr. J. V. Crossley,** M.Sc., F.P.I., has been elected chairman of the Council.

Now that the organisation of the Indian Steelworks Construction Co., Ltd., is fully established, **Mr. R. J. Barritt** is resigning as managing director as from 1st September next in order to return to company work. He will, however, be available to the board of ISCON for consultation. **Mr. W. S. Hindson,** at present chief engineer of the company, has been appointed to succeed him as managing director. The Indian Steelworks Construction Co., Ltd., is a consortium of thirteen engineering and electrical manufacturing companies in Great Britain, formed to build the Durgapur Steelworks in West Bengal for the Government of India.

The Board of Trade announces that the **Earl of Halsbury** will retire from the position of managing director of the National Research Development Corporation on 31st March next to take up another appointment.

Five members of **Aerialite, Ltd.,** have each completed twenty-five years' service with the company and to commemorate the occasion Mr. L. S. Hargreaves (chairman) presented a gold wristlet watch to Mr. F. G. Hargreaves (director), Mr. J. Glickman (branch manager, Manchester), Mr. R. Griffiths (dispatch manager), Mr. J. Smith (maintenance carpenter) and Mr. H. Buckley (rubber mill charge-hand).

Major-General C. J. Venter, C.B., D.F.C., who was chief manager of South African Airways from 1945 to 1956 when he retired, has joined the board of the English Electric Co. of South Africa. Major-General Venter was a foundation member of the South African Air Force in 1922 and was Director-General of the S.A.A.F. from 1940 to 1945. He was appointed a director of Marconi (South Africa), a member of the English Electric group of companies, in 1956.

Maj.-Gen. C. J. Venter

Mr. R. J. Buckingham has been appointed area manager of the South Wales Branch of Ekco-Ensign Electric, Ltd., at Cardiff following the departure of Mr. A. J. Davies to take up the appointment as sales manager

of the Lighting Division of Thorn Electrical Industries, Australia. Mr. Buckingham joined Ekco-Ensign, Cardiff, in 1945 and after various positions in the area he has for the past three years been senior sales representative.

Mr. R. P. Mason, commercial manager of Venner Accumulators, Ltd., left London Airport for Scandinavia on 20th July to visit concessionaires of the Andre-Yardney system of lightweight silver-zinc accumulator manufacture. He will return on 30th July.

Mr. O. W. Humphreys has been appointed chairman of the Advisory Committee on Wireless Interference from Ignition Apparatus, in succession to **Sir Stanley Angwin,** who has resigned because of ill-health.

Mr. A. Watson, technical sales manager of Newman Industries, Ltd., Yate, retired on 11th July after twenty-five years with the company.

Mr. C. L. G. Hyde, B.Sc., M.I.Mech.E., M.I.E.E., who has been with the Fuller Electric, Ltd., for nearly thirty-nine years, has retired. Following service with the Royal Engineers in the 1914-18 war, attaining the rank of captain, Mr. Hyde joined the company in 1920 and after a training period with ASEA, Sweden, at that time the parent company, returned to London as an assistant engineer. Mr. Hyde has been responsible for handling many of the company's important contracts for power development in this country and abroad and, for some years before his retirement, had been manager of the Power Department. He is succeeded by **Mr. G. T. D. Ingle,** B.A.(Hons.) (Cantab.), who has been deputy head of the department for the past five years.

A farewell dinner party for Mr. Hyde was held at the Swedish Club, London, on 10th July, attended by the management and senior executives, and a gift in the form of a portable typewriter, subscribed for by colleagues, was presented to him by Mr. N. Plahn, managing director, together with a separate gift from the ASEA group in Sweden.

Farewell dinner to Mr. C. L. G. Hyde, (Fuller Electric, Ltd.). Left to right: Mr. Hyde, Mr. N. Plahn, managing director, and Mr. D. N. Dow, company secretary

The United Kingdom Atomic Energy Authority has appointed **Dr. N. Levin** to be a deputy director of the Atomic Weapons Research Establishment.

Mr. G. W. Gibson, managing director of Fry's Metal Foundries, Ltd., retired on 30th June after completing over forty-four years' service with the company. He joined Mr. J. Fry in January, 1914, and became manager of the newly-opened Manchester foundry in 1916. After four years he returned to the works in London, first as manager of the Printing Metal Department and later as a director. In 1947 he was appointed managing director and he remained in that position until his retirement. **Mr. R. G. Harper** has been appointed managing director of the company.

In the picture taken at the Great Yorkshire Show, published in our last issue, the fourth gentleman from the left is **Major C. L. Baldwin,** M.C., J.P., a member of the North Eastern Electricity Board, and not Col. E. G. Angus as stated.

The annual Parents' Day of the **Bankside Apprentice Training School** of the London Division of the Central Electricity Generating Board was held on Friday last week, when a large number of the apprentices' parents and friends visited the school and were conducted round by the boys and shown some examples of their work. Following the inspection, the visitors and apprentices proceeded to the Institution of Electrical Engineers where tea was served, after which the annual prize distribution took place.

Mr. H. J. Bennett, divisional controller, London Division, welcomed the visitors, and in particular Sir Christopher Hinton (chairman of the C.E.G.B.) and Lady Hinton, and Mr. A. R. Cooper (member of the C.E.G.B. and director, Eastern, London and South Eastern Region). He also paid tribute to the work of Mr. G. W. Whitmell, the apprentice training officer. Mr. Whitmell, in presenting his progress report, mentioned that this was the fifth year of the school, and the first apprentices were now taking their place in the industry. Mr. Cooper, in introducing Sir Christopher Hinton, spoke in felicitous terms of his accomplishments.

Sir Christopher, in an inspiring address to the boys, spoke of the rapid advances which were being made in power plant design and emphasised the necessity for proceeding with nuclear power plants in order that they would be ready to make up for the deficiency in the conventional forms of fuel which was anticipated by 1965. He also referred to craftsmanship in the industry which, he said, was as important as management and design. Following his address, the prizes were presented by Lady Hinton.

A dinner was held on 18th July at the Midland Hotel, Birmingham, by **William McGeoch & Co., Ltd.,** for the presentation of long-service awards. The company recently introduced a scheme for marking the completion of the first 25 years of continuous

William McGeoch & Co.'s long-service presentations. Left to right: Mr. W. Percy McGeoch, Sir Hamish MacLaren and Mr. C. C. Knowles

employment and twenty-six people received awards. In addition to the recipients and their relatives, heads of departments and other guests were invited. Mr. W. Percy McGeoch, works managing director, presided, and he was one of those who received an award. Gold watches and gift tokens were presented by Sir Hamish MacLaren, K.B.E., C.B., D.F.C., Director of Electrical Engineering, Admiralty, Bath. The oldest serving member to receive an award (51 years' service) was Mr. E. A. Savory, a departmental manager; other recipients included Mr. C. C. Knowles (works manager), Mr. I. H. Macqueen (works production manager), Mr. G. Sparks (chief electrical inspector) and Miss Alice Green (Lampholder Department). A vote of thanks to the directors was proposed by Mr. Savory. Mr. A. Stewart (director) proposed the toast to the guests, response being made by Councillor E. N. Hiley, M.B.E., J.P., secretary, National Brassfoundry Association.

The South Western Electricity Board announces the appointment of managers for its newly-formed Taunton and Exeter Districts, and for East Cornwall District. The three new managers are **Mr. G. C. R. Ridge,** A.M.I.E.E. (Taunton), **Mr. F. Richardson,** Associate I.E.E. (Exeter), and

Mr. G. C. R. Ridge

Mr. F. Richardson

Mr. F. C. Isaac

Mr. F. C. Isaac, A.M.I.E.E. (East Cornwall).

These appointments follow the introduction by the Board earlier this year of a simpler form of organisation in its area which will gradually reduce the number of Districts from 19 to 12. The new Taunton District will include the existing Taunton, Bridgwater, and Minehead Districts, and that part of the Exe Valley District in the county of Somerset; the new Exeter District will include the existing Exeter and East Devon Districts and part of the Exe Valley.

Mr. Ridge has been in the electrical industry for thirty years. He was educated at Huish's Grammar School, Taunton, and received his technical training with Taunton Corporation Electricity Department. From 1930 to 1934 he was an assistant engineer with the Corporation, and subsequently was appointed overhead lines engineer; from 1938 to 1948 he was the technical assistant and then was promoted to deputy borough electrical engineer. For over twenty years he was a lecturer in electrical engineering at the Taunton Technical Institute. On nationalisation of the industry Mr. Ridge became sub-area engineer, Taunton, and recently he was appointed group engineer in Somerset. He will take up his new post later this year.

Mr. Richardson has been the Board's assistant chief commercial officer (supply) since 1953. He spent his early years in the electrical manufacturing industry with W. T. Henley's Telegraph Works Co., Ltd. In 1937 he was promoted to be their engineer in charge of contracts in the Midland and South Wales areas, and in 1942 was appointed contracts manager in Northern Ireland. Mr. Richardson joined the South Western Electricity Board in 1949 and was appointed area construction engineer with special responsibility for setting up the Board's Central Construction Department at Taunton. At the same time he organised the Linesmen's Training School there, and initiated original research into the prevention of decay and preservation of wood transmission line poles. Two years later he was promoted to be assistant chief engineer (construction) and led a team which standardised the Board's overhead line construction and substations. In 1953 he was appointed assistant chief commercial officer (supply) at the Board's headquarters in Bristol.

Mr. Isaac has been the Board's district engineer, Plymouth, since 1954. After his early technical training in Plymouth, he was appointed assistant engineer in the Plympton Council Electricity Department in 1934 and in 1937 was promoted to be chief assistant electricity engineer. During the last war he served with the Royal Naval Volunteer Reserve, attaining the rank of lieutenant commander. He was appointed deputy electrical engineer, Plympton Council Electricity Department, after the war and in 1948 he became district commercial engineer, Plymouth, being promoted to district engineer, Plymouth, in 1954. Mr. Isaac has been a lecturer in electrotechnics at Plymouth Technical College.

Mr. P. H. Myerscough, A.M.I.P.E., A.S.M.A., has been appointed general sales manager of Sunbeam Electric, Ltd., Glasgow, responsible for home, export and advertising. Mr. Myerscough has spent twenty-four years with Hoover, Ltd., for the past ten of which he has been branch sales manager, West and South.

Mr. P. H. Myerscough

Messrs. J. H. Baumann and **J. H. Dawson** have been appointed directors of the Ship Carbon Co. of Great Britain, Ltd., and **Mr. H. I. Matthey** has resigned from the board.

It is ten years since the **Central Electricity Board** became part of the nationalised electricity supply industry. To mark this passage of years, workmen and staff who were employed by the Central Electricity Board in the South Western Region have arranged to hold a reunion dinner in Bristol on 25th October next. All those who were employed by the C.E.B. are invited and they should get in touch with Mr. A. A. Beckingsale, the Electricity Council, 26, Oakfield Road, Bristol, 8.

Mr. D. I. Lawson, M.Sc., F.Inst.P., M.I.E.E., has been appointed director of fire research of the Joint Fire Research Organisation of the Department of Scientific and Industrial Research and the Fire Offices Committee whose Fire Research Station is at Boreham Woods, Herts. Since 1952 he has been assistant director to Mr. S. H. Clarke, C.B.E., whom he succeeds on 1st August. Mr. Clarke's appointment as director of the D.S.I.R.'s Warren Spring Laboratory, which is being built at Stevenage, was announced earlier in April this year.

Mr. Lawson was educated at Woodhouse Grammar School. After taking first-class honours in physics with mathematics at Manchester University and gaining a Master of Science degree for research in X-ray crystallography, he became a lecturer in physics and telecommunications at Woolwich Polytechnic in 1934. Five years later he was appointed head of the Research Division of Pye, Ltd., Cambridge. Mr. Lawson joined the Fire Research Station in 1948, since when he has specialised in problems of heat transfer and the ignition of materials.

Mr. J. E. Hinde has been appointed organisation and methods officer in the Metal Industries group of companies. Mr. Hinde, who will take up his duties in August, was previously with the London County Council, the Plessey Group and the Bristol Aeroplane Co.

King Gustav VI of Sweden has conferred on **Mr. C. W. Robinson** the decoration of Chevalier First Class of the Royal Order of Vasa in recognition of his services to Sweden and Swedish interests. Mr. Robinson is Honorary Consul for Sweden and managing director, Uddeholm, Ltd., Birmingham.

The annual outing of **Oldham & Son, Ltd.,** was held on 5th July when more than a thousand employees visited Blackpool. The guests included the Deputy Mayor of Blackpool, Alderman J. Hessey, and Mrs. Hessey, and an address was given to the employees by Mr. J. Oldham, chairman of the company.

OBITUARY

Mr. E. W. Bussey.—The death occurred on 16th July of Mr. Ernest William Bussey, C.B.E., the former general secretary of the Electrical Trades Union, and, in later years, a member of the British Electricity Authority.

The late Mr. E. W. Bussey

Mr. Bussey was born in 1891 and educated at the West Ham Technical Institute where he took a course in electrical engineering. After four years with the West Ham electricity undertaking he joined the Tramways Department of the L.C.C. and continued in the service when the tramways were taken over by the London Passenger Transport Board. He left the Board in 1941 when he was appointed general secretary of the Electrical Trades Union, of which he had previously been general president. He was at one time a member of the N.J.I.C. for the Electricity Supply Industry and the N.J.I.C. for the Electrical Contracting Industry and also took an active part in national negotiations in other

industries. When he succeeded Mr. J. W. Rowan as general secretary of the E.T.U. Mr. Bussey became a member of the General Council of the T.U.C. and served on that body until his appointment in 1947 as a member of the Organising Committee which was set up by the Minister of Fuel and Power to make the necessary plans and arrangements for the reorganisation of the electricity supply industry as a national industry. Subsequently, he was appointed a full-time member of the British Electricity Authority with special duties in labour relations and welfare. Owing to failing health, he relinquished his appointment in 1952, but continued to serve the Authority for the next four years as chairman of the employers' side of the negotiating bodies in the industry. From 1942 to 1945 Mr. Bussey was a member of the Ministry of Production's Industrial Panel.

Mr. Percy Wardle, A.M.I.E.E., who retired from the position of district manager, Cannock District, Midlands Electricity Board, at the end of 1950, died on 4th July at the age of seventy. Before nationalisation he was chief engineer and general manager of the Cannock Urban District Council Electricity Department, a position he had occupied since 1930. He had served in the electricity supply industry for forty-two years, having held positions at Rochdale, Rawtenstall, Carlisle and Walsall. Mr. Wardle served a period on the Council of the Incorporated Municipal Electrical Association.

WILLS

Mr. W. Hawthorne, B.A., B.E., M.I.C.E., M.I.E.E., for many years with Merz and McLellan, Newcastle-upon-Tyne, who died on 29th December last, left £18,373 gross (£17,969 net).

Mr. G. Perrins, A.M.I.E.E., a former director and chief engineer of Bullers, Ltd., who died on 7th March last, left £9,948 gross (£9,090 net).

Mr. J. H. Pawley, a director of George Cohen Sons and Co., Ltd., who died on 15th April last, left £13,468 gross (£13,099 net).

Tinplate Workers' Scholarships

THE Worshipful Company of Tinplate Workers announces the award of travelling scholarships for 1958 (value £50) to the following:—T. De Vere, employed by Scanners, Ltd., presented by B.E.A.M.A. and sent to Enfield Rolling Mills, Ltd.; D. P. Longworth, employed by the Metropolitan-Vickers Electrical Co., Ltd., presented by B.E.A.M.A. and sent to British Railways, Swindon; B. A. Randles, employed by John Thompson, Ltd., presented by W.T.B.M.A. and sent to Enfield Cables, Ltd.; P. Newstead, employed by International Combustion, Ltd., Derby, presented by W.T.B.M.A. and sent to South Wales Steel Works; J. MacKenzie, employed by Yarrow & Co., Ltd., presented by W.T.B.M.A. and sent to British Railways, Derby; A. Bourne, employed by the Steel Company of Wales, Velindre Works, presented by the Welsh Plate and Sheet Manufacturers' Association and sent to the Metropolitan-Vickers Electrical Co., Ltd.; C. Morgan, employed by the Steel Co. of Wales, Trostre Works, presented by the Welsh Plate and Sheet Manufacturers' Association and sent to Imperial Chemical Industries, Metals Division; R. B. Hutson, employed by W. T. Henley's Telegraph Works Co., Ltd., presented by C.C.A. and sent to John Thompson & Co., Ltd.; R. E. Hazel, employed by Enfield Rolling Mills, Ltd., presented by H.C.A. and sent to a C.E.G.B. power station; C. Clayton, employed by British Railways, Derby, presented by the British Transport Commission and sent to W. T. Henley's Telegraph Works Co., Ltd.; T. K. Marston, employed by the C.E.G.B. and presented by the C.E.G.B. and sent to Enfield Rolling Mills, Ltd.; A. R. Dainton, employed by Guest Keen & Nettlefolds, South Wales, presented by the Institute of Iron and Steel Wire Manufacturers and sent to Yarrow & Co., Ltd.; T. Dale, employed by the Yorkshire Imperial Metals, Ltd., presented by the British Non-Ferrous Metals Federation and sent to the Metropolitan-Vickers Electrical Co., Ltd.; and R. E. Ford, employed by R.E.M.E. Base Workshops, Chilwell, presented by the War Office and sent to Guest Keen & Nettlefolds, South Wales.

Labour Party's Plan for Industry

EXCEPT on the servicing and safety of certain domestic appliances the Labour Party's "Plan for Progress" contains no specific reference to the electrical industry, but many of the proposals it makes for the future regulation of the economy would have a marked effect in both the private and nationalised sectors. In the preface the authors "stress one obvious truth" with which there will be general agreement. "A Government can only create the conditions which make progress possible. Success will depend upon the efforts, the hard intelligent work, and the sense of corporate responsibility of each one of us." But inevitably, the Plan makes it clear that there are many occasions when a Labour Government would decide specifically what should happen.

Planning, it is emphasised, does not mean a return to detailed controls. It should be concerned with larger decisions—matching savings with investment, imports with exports, spending with production and jobs with workers. It must also be concerned with increasing the production of those types of goods which are needed in the national interest and where necessary holding back those that are less essential. "Much of what is needed can be obtained by consent alone. A partnership between the state and both sides of industry is essential to democratic planning."

The first task of the next Labour Government will be to raise and then maintain the level of investment in industry. This above all else "will determine the future prosperity of Britain." If a seriously depressed economy is inherited, demand will be stimulated by large capital investment programmes for the modernisation and development of the nationalised industries and for the building of modern highways. The Capital Issues Committee will be continued but large firms that at present obtain new money from other sources will be required to draw up and report their investment plans on a longer-term basis than at present so that measures can be taken "to retard or accelerate them according to economic needs."

In external economic policy the first priority will be the strength of the pound. The whole question of export credits will be reviewed and East-West trade encouraged.

Another important part of Labour's industrial policy will be to release the forces of change in the economy and break down those monopoly arrangements, particularly those limiting price competition, that are retarding progress. The operation of the 1956 Restrictive Trade Practices Act will be speeded up and amended so that the Co-operative Movement and other traders which pay deferred discounts cannot be brought before the Courts as price cutters.

Public enterprise will be used to stimulate competition and new developments; good social policies in industry; and research and management training. Help for the consumer will be extended through drawing up quality standards, and if necessary prohibiting the manufacture and importation of sub-standard goods; by protection against unfair hire purchase agreements; and strengthening the enforcement of existing measures.

Overseas Electrical Trade

The value of exports of British electrical machinery and plant in June totalled £15,124,188. This was over £4 million less than for the preceding month and about £4·4 million less than for the corresponding month of last year. The total for the first half of 1958 of £111·6 million was also nearly £4 million lower than for January-June, 1957. Fuller details of the export figures will appear in our next issue.

PARLIAMENTARY REPORT

Scottish Hydro-Electric Project

A motion to annul the Confirmation Order for the Strathfarrar and Kilmorack project of the North of Scotland Hydro-Electric Board was moved in the Commons by Mr. Nabarro. This project, he said, was to cost £140 per kW installed and would operate at only 29 per cent load factor. He did not deny the essential need for increasing the generating facilities but believed that the method proposed in the Order was unnecessarily expensive and likely to be uneconomic. The alternative which he proposed was a combination of pumped storage, using the water referred to in the hydro-electric scheme, working in parallel with a nuclear power station. To carry out the whole of the project in the Order would cost £14·5 million, whereas if the Government adopted his alternative the capital cost of the pumped storage station would be no more than £3·5 million. The Hunterston station would be there already, idling overnight.

Replying for the Government, Mr. Macpherson, Under Secretary, Scottish Office, said Mr. Nabarro had based his objections entirely on the ground that this project was not for the right kind of generation. In considering costs, it had to be remembered that the cost of a hydro-electric station set up in Galloway in the 1930s was about 0·2d/kWh, and the cost was still 0·2d; but in the case of steam stations put up at about the same time with the same cost per kWh the figure was now four times as great. In the North of Scotland District the average cost of electricity produced from hydro-power alone last year was under 0·6d/kWh, whereas the average cost from both hydro and steam was 0·7d. The estimated cost of the electricity to be produced by the Strathfarrar scheme was 0·75d/kWh. This compared with the total average for England and Wales in 1956-57 (it had gone up since then) of 0·86d. It was true that with schemes prepared some years ago when there was no experience of post-war conditions the final cost was greatly in excess of estimates for reasons beyond the Board's control. But in later schemes the final costs had been much nearer the estimates. For example the cost of the Shin scheme, now nearing completion, was estimated in March this year as £8,900,000, as against the original estimate of 1953 of £8,800,000.

The low cost of the Loch Awe pumped storage scheme had been mentioned. One of the Board's main reasons for promoting this scheme was that it was expected that by the time it was completed in 1964-65 there would be available both cheap supplies of base load power to do the pumping and also a demand for the peak power produced. Until then, these conditions would not be fulfilled. He could assure Mr. Nabarro that the anticipated base load production from Hunterston was fully committed in the early years of its operation. What the Board needed by 1962 was 100,000 kW of intermediate load and this could be provided by the Strathfarrar scheme. The Board intended to construct a nuclear station in the North-East of Scotland, but not before 1965, because the conditions for a nuclear station in that area would not be fulfilled until then. Until that time, there would not be adequate demand for base load electricity to justify the station.

The motion was defeated by 122 votes to 2 (Mr. H. E. Atkins and Sir John Barlow). Mr. Nabarro and Sir David Robertson were tellers for the "Ayes."

Trade with China

Replying to Mr. Ellis Smith, the President of the Board of Trade (Sir David Eccles) said that the prospects of trade with China depended mainly on the trading policies of the Chinese authorities. Recent trade confirmed the forecast made by the Ministry in December that we could expect to see a steady but not a sudden or spectacular increase. He added that Britain and China were exchanging purchasing missions. The Chinese mission here had been successful, and the Government were arranging an exhibition of British goods in Peking in 1960.

Relations with Euratom

The Prime Minister (Mr. Macmillan) informed Mr. Hynd that the Government had given careful consideration to this country's relations with Euratom since that organisation came into being. They had accredited Sir William Meiklereid to the Euratom Commission and had opened discussions for an agreement for co-operation between the Commission and the Government. He was confident that arrangements on these lines would result in a close and fruitful collaboration. The Government also had bilateral agreements with most of the individual member countries of Euratom, and they were fellow members with us of the European Nuclear Energy Agency set up by the Organisation for European Economic Co-operation.

Sir Spencer Summers asked the Prime Minister to bear in mind that there might be very grave objections, and indeed handicaps, to British industrialists if full membership of Euratom were contemplated by the Government.

Mr. Macmillan: "Yes, that is why, in the first instance at any rate, we proposed to open discussions for co-operation." Replying to another question, he said that there would be great difficulty for Britain in accepting full membership.

Thermonuclear Fusion

Replying to a question by Mr. Roy Mason, the Prime Minister said that experimental work on thermonuclear fusion at the Atomic Weapons Research Establishment at Aldermaston was directed towards a better understanding of the mechanism by which high gas temperatures could be achieved. The encouraging results to date did not alter earlier predictions about the probable time-scale of the development of thermonuclear power. The Authority were recruiting some additional staff for this work.

Future of Government Pavilion at Brussels

Lady Gammans asked the President of the Board of Trade whether he would be willing to consider the possibility of re-erecting the British Pavilion at the Brussels Exhibition on a site in London once the Exhibition had closed.

Sir David Eccles said that the Government would in due course consider whether some further use of the building and its contents could be made, but he was informed that it would be difficult to dismantle the pavilion and re-erect it on another site.

B.T.C. Capital Investment

The Minister of Transport (Mr. Watkinson), replying to Mr. Ernest Davies, said that the additional £25 million which the Government authorised last May was as much as the British Transport Commission felt they could usefully spend. It brought the level of investment well above that planned when the restrictions were imposed and would enable the Commission to accelerate the projects that would give an early financial return.

Australian Railway Contract

A repeat order for 90 motor coaches and 120 trailer coach electric traction equipments, valued at over £1,000,000, has been placed with the English Electric Co. (Australia), Ltd., by the Victorian Railways of Australia. The motor coaches, which are over 60ft long and seat 59 passengers, are designed to operate in multiple unit in a variety of ways, e.g., they can be used in two-car sets with one trailer coach, or equally efficiently in trains of two motor coaches and three trailers. This is the fourth substantial order from Victorian Railways to be placed with the company within the last few years.

INDUSTRIAL NEWS

Diesel-Electric Locomotive Orders

As part of the recently accelerated programme of partial conversion to diesel traction on British Railways, the British Transport Commission has now placed orders for 124 main-line diesel-electric locomotives for mixed-traffic duties. A batch of forty complete locomotives of this type is to be built by the Brush Electrical Engineering Co., Ltd., of Loughborough, and the remaining eighty-four are to be erected in British Railways' workshops incorporating traction equipment supplied by the British Thomson-Houston Co., Ltd., Rugby. Deliveries of the locomotives and traction equipment will begin early in 1959. The Eastern Region is to have 106 of the 124 locomotives now ordered. The remaining eighteen units will be allocated to the North Eastern Region. All the locomotives will be in the 1,000-1,250 h.p. range, classed as Type 2 in the British Railways classification of main-line diesel locomotives.

The Great Orme Railway

The drive for a winding gear powering the Great Orme Railway at Llandudno has recently been installed by the English Electric Co., Ltd. The electrification scheme has replaced the steam engine drives which were originally installed when the railway was opened in 1902-3. The railway, which is of the rope-hauled tramway type, runs from Victoria station to the summit of the Great Orme headland in two separate inclines. The lower incline, which is 800 yards long with sharp curves, rises 400ft with a maximum gradient of 1 in 4·4. There is a half-way station where passengers change cars for the second incline, which is 827 yd long but rises only 150ft with a maximum gradient of 1 in 10·3.

The half-way station houses the winding and control gear, and originally contained the old steam engine which the electric drive has replaced. The changeover was made during the winter when the railway is closed, and the new equipment consists of an English Electric 125 h.p. slipring induction motor for 415 V, three-phase, 50 c/s supply which drives the cable drums for the lower haulage, and a similar 75 h.p. motor for the upper haulage. Both motors have speed control by rotor resistances operated by a drum controller. The original cable drums are now driven through new gear units to convert the motor speed of about 730 r.p.m. to the drum speed of 25 r.p.m. (lower haulage) and 35 r.p.m. (upper haulage).

Communications between the cars and the half-way station is by telephone and bell through an overhead wire to which the cars connect by trolley poles.

In the motor house at the half-way station the two drives are controlled from a common driving platform, each with its drum controller, tachometer, ammeter, telephone, bell communication, and emergency stop switch. In addition, a handwheel operating a screw-down brake on the coupled winding drums is arranged on each platform.

Contract Price Formulæ

The British Electrical and Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 18th July is deemed to be 186s 6d.

The "costs of materials" figures are: For electrical machinery and equipment the Board of Trade index figure published on 18th July is 177·4 (1949=100) and 114·4 (1954=100); both figures are provisional. For turbo-generating and allied plant: Materials used in mechanical engineering industries 185·4 (1949=100) and 123·4 (1954=100), blast furnaces and iron and steel melting and rolling (40 and 41) 191·1 (1949=100) and 130·2 (1954=100); figures are provisional. The price of ¾in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 18th July) is 43½d per lb.

Prices of Materials

In the accompanying table we give the basic prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £180 0s 0d
COPPER, H.C. Electro	ton £201 10s 0d
Fire Refined 99·70%	ton £200 0s 0d
Fire Refined 99·50%	ton £199 0s 0d
COPPER Tubes	lb 1s 11½d
Sheet	ton £230 15s 0d
H.C. wire and strip	ton £252 15s 0d
LEAD, English	ton £71 5s 0d
Foreign	ton £70 0s 0d
MERCURY	flask £79 0s 0d
TIN, block (English)	ton £731 5s 0d
ZINC, G.O.B. Foreign	ton £63 15s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 1s 7½d
Sheet	ton —
Wire	lb 2s 4½d
PHOSPHOR BRONZE Wire	lb 3s 9d
PLATINUM	oz £23 5s 0d
RUBBER, No. 1 R.S.S. spot	lb 23¾-24d

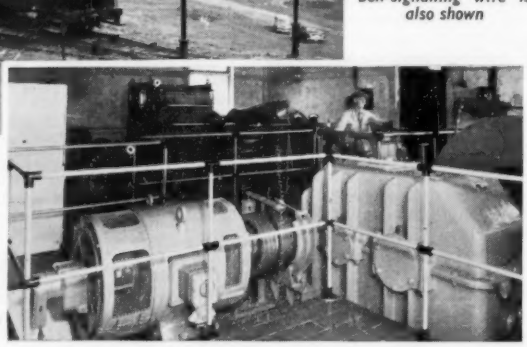
Mining Qualifications Board

The mining legislation examinations for mechanical engineers' certificates, electrical engineers' certificates, mechanics' certificates Class I and electricians' certificates Class I will be held at Glasgow, Sunderland, Doncaster, Wigan, Cardiff and Stoke-on-Trent on 18th November. Intending candidates should apply after 25th August for the necessary forms, stating whether they have previously attended an examination. Applications should be returned to the Secretary, Mining Qualifications Board, Ministry of Power, Thames House South, Millbank, London, S.W.1, by 23rd September.

New B.B.C. Television Station

The B.B.C.'s new low-power television transmitting station at Folkestone was brought into operation on 14th July. The transmissions will at

Left: Great Orme Railway. Upper haulage at mid-point showing passing loop, with the winding station in the background. The overhead telephone and bell-signalling wire is also shown



Right: General view of winding house equipment. The 125 h.p. drive for the lower incline is in the foreground. The operators sit back to back

The Duke of Edinburgh at the Brussels Exhibition

first be on an experimental basis as the equipment, which is designed to work unattended, is of a new type recently developed by the B.B.C. for the purpose of improving reception over limited areas.

Royal Visit to Brussels

The highlight of the three British Days at the Brussels Exhibition earlier this month was the visit of the Duke of Edinburgh. The Duke spent over an hour in the British Industry Pavilion, and in this photograph he is seen on the British Electrical and Allied Industry stand examining a model illustrating the transmission and distribution of electricity. He is accompanied by Mr. J. O. Knowles, chairman of the B.E.A.M.A. Council, and Mr. D. Maxwell Buist, chairman of the organising committee of the industry's collective exhibit and export director of B.E.A.M.A.

Windscale Pile No. 1

The United Kingdom Atomic Energy Authority has decided that it would not be economic to rehabilitate Windscale Pile No. 1. Announcing this, the Authority says that the maximum technical information which can be derived from examination of the reactor core is being obtained. Useful materials and equipment will be recovered. Some of the buildings will be adapted to other uses and the remainder sealed off. The operatives hitherto employed on this reactor are now engaged on other activities at Windscale, which are expanding.

G.E.C. Export Guide

The June issue of the "Export Guide," produced by the General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2, records for the first time a marked deterioration of export prospects in some of Britain's best overseas markets. However, favourable outlook in several overseas countries continues, and in a few of them export opportunities for British manufacturers and traders have improved. The latest information available in this country on the export prospects for thirty - six major groups of British manufactured goods in Britain's thirty-four major export markets is given in the Guide, with an indication of current economic and commercial conditions in these countries. Present export prospects are good in 11 countries, improving in seven cases, deteriorating in ten, and bad in six. Changes in trading opportunities for British exporters during the second quarter of 1958 have been considerable. Export opportunities are better in Denmark and the Netherlands and they have further improved in Trinidad. The outlook has deteriorated in Argentina, Burma, Ceylon, the Irish Republic, Norway, Pakistan, South Africa and West Germany. The coloured charts are preceded by a review of prospects for East-West trade and the development of West German exports.

Plessey Apprentice Training School

A new apprentice training school attached to the Plessey Co., Ltd., at Swindon was officially opened on 10th July by the Mayor of Swindon who, in company with representatives from local industry, various schools, colleges, and the Press, was welcomed by Mr. A. E. Underwood, resident director, and other executives of the company. Mr. A. E. Balchin, M.I.Prod.E., training and education officer, and a committee consisting of executives and managers from various departments of the Swindon group of factories, will control the school. During the five-year training period apprentices will be initiated into all the various aspects of engineering techniques throughout the Plessey works at Swindon, spending part of their last year in practical training in management duties—supervision, planning, estimating and production control. The building includes a lecture room, projection apparatus for films, etc., drawing office and machine shop.

Hull Telephones

Hull Corporation, which operates Britain's only independent telephone system, has adopted the Siemens-Ediswan "Centenary Neophone" as the standard telephone instrument for its subscribers. The Corporation Telephone Department has placed an initial order for 1,000 instruments with Siemens Edison Swan, Ltd.

Colliery Year Book

The "Colliery Year Book and Coal Trades Directory 1958," the 36th edition, published by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1 (price 40s net, 42s by post), presents in a convenient form the fullest information on the coal mining and allied industries. The data in the standard and statistical sections have been thoroughly revised and, in addition to information on the coal mines in Western Europe and the United States of America which has been a feature during the past few years, details of coal mining in Poland and the U.S.S.R. are now included. Full particulars of every coal mine in Great Britain are given, together with current information regarding the

Left to right : Messrs. P. S. Grant and W. R. Rowe (sub-area commercial officers for Devon and Cornwall, South Western Electricity Board), W. H. Mortimer (F. D. Newcombe & Co., Ltd.), R. Berry (chairman and managing director, Berry's Electric, Ltd.), and P. M. Kenwood (Berry's branch manager), at the Berry's Electric trade exhibition held at its recently modernised Exeter showrooms

Ministry of Power and the National Coal Board, and the Mines and Quarries Regulations, 1956, with the 1957 amendments.

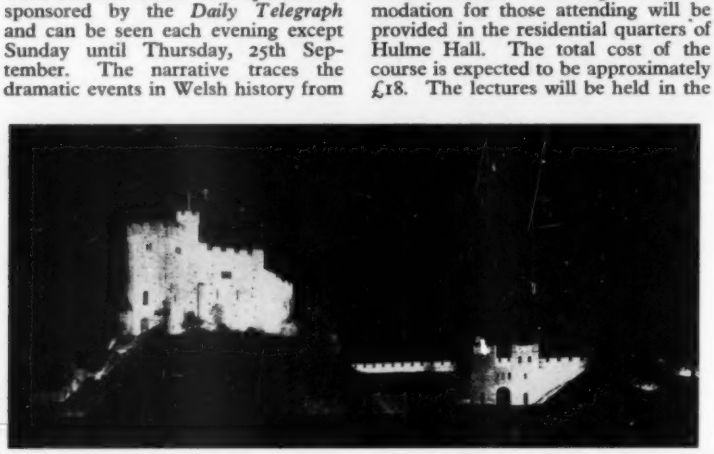
Lord Mills, Minister of Power, has contributed a foreword in which he stresses the importance of continuing the modernisation of the industry and the need for a sound reference book, both in Britain and abroad.

Changes in Export Licensing

The Board of Trade announces certain changes in export licensing to come into force on 28th July. Owing to the easier supply position licences are no longer required for the export of ingots, billets, blooms and other semi-manufactures of carbon steel or non-strategic nickel bearing steels.

"Son et Lumiere" at Cardiff Castle

A new presentation of *Son et Lumière* at Cardiff Castle began a ten-week run last week. The spectacle is sponsored by the *Daily Telegraph* and can be seen each evening except Sunday until Thursday, 25th September. The narrative traces the dramatic events in Welsh history from the Roman and Norman occupations to the present day.



The Keep and North Gate of Cardiff Castle during the "Son et Lumière" spectacle

The lighting installation has been designed by the theatre lighting department of Atlas Lighting, Ltd., and was carried out in conjunction with the South Wales Electricity Board. The sound equipment has been designed and supplied by E.M.I. Sales & Services, Ltd.

Nearly 300 fluorescent tubes and incandescent lamps are used and the total electrical load is about 75 kW. The fluorescent lighting, which includes white, gold, blue, red, and green tubes, many of the reflector type, is used for colour effects; and the incandescent lamps, which range from a special 3,000 W mirrored lamp to a 24 V, 12 W lamp for miniature floodlights, are used for strong directional and dramatic effects and also for "movement lighting." Among the special fittings used are a number of 150 W narrow angle spots operated at low voltage and controlled by miniature saturable reactors. All light sources are controlled from a hut adjacent to the audience area. Control is by Atlas electronic dimming, the main panel having 54 individual dimmer ways and there are also 24 selector ways on the two master dimmers.

Non-Destructive Testing

A summer school on the principles and practice of non-destructive testing intended to benefit senior and chief inspectors from industry, is to be held in Manchester from 8th to 12th September and applications for places are invited. The school has been sponsored by the British National Committee for Non-Destructive Testing and is being organised by the Manchester College of Science and Technology, the Manchester Association of Engineers and the Institution of Engineering Inspection. The organising lecturer is Dr. J. H. Lamble of the Manchester College. Accommodation for those attending will be provided in the residential quarters of Hulme Hall. The total cost of the course is expected to be approximately £18. The lectures will be held in the Mechanical Engineering Department of the Manchester College of Science and Technology. Applications should be made to the secretary, the British National Committee for Non-Destructive Testing, 1, Birdcage Walk, Westminster, London, S.W.1.

Labelling Scheme

The Council of Industrial Design is to launch a labelling scheme in the autumn for use in association with products that have been shown in the Design Centre and are in "Design Index." The labels will be issued to manufacturers for attachment to products before they leave the factory.

Versatile Telephony

South African Railways are to extend their private communication facilities still further by the installation of seven private automatic branch exchanges using high-speed motor uniselectors for the main switching circuits. The new exchanges, which involve a total of 1,000 lines initially and are equipped for 2,300 lines ultimately, will embody voice frequency signalling equipment.

Equipment for the seven new exchanges will be manufactured by Siemens Edison Swan, Ltd. They will be of their No. 17 type which, in addition to the speed of operation, provide simplified routing, space saving and low maintenance cost. Low pattern cord type manual switchboards will also be provided for dealing with traffic to and from the Post Office system and the Railways' own network.

Foundry Agreement

The boards of G. & J. Weir, Ltd., and Catton & Co., Ltd., have decided to combine their foundry activities by forming a new company, Weir-Catton, Ltd., to acquire the capital of Catton & Co., Ltd., and the capital of the Argus Foundry, Ltd., a wholly owned subsidiary of G. & J. Weir, Ltd. The share capital of Weir-Catton, Ltd., will be owned as to 50 per cent by G. & J. Weir, Ltd., and as to 50 per cent by the existing shareholders of Catton & Co., Ltd. It is hoped that the new company will be formed before 30th September next. Under the new arrangement the name of the Argus Foundry, Ltd., will be changed to Weir Foundries, Ltd.

Epicyclic Gears for Tunnelling Machine

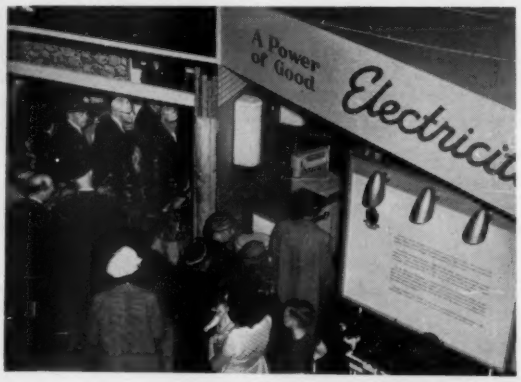
W. H. Allen, Sons & Co., Ltd., are to provide the speed-reduction gears for the new tunnelling machine being developed by the National Coal Board's Central Engineering Establishment. The gears are required for reducing the speed of the motors driving the contra-rotating cutter heads. Four gears will be mounted on the machine, each designed to transmit 160 h.p. and capable of giving two alternative output speeds varying between 55 and 8 r.p.m. All four epicyclic gear-boxes will be mounted within the scantlings of the machine, which is approximately 18ft in diameter.

Works Visit

A recent visitor to the Woolwich works of Siemens Edison Swan, Ltd., was the Hon. Chief S. L. Akintola, M.H.R., Nigerian Federal Minister of Communications and Aviation. He was accompanied by his private secretary, Mr. A. O. Oredugba, and by Mr. J. Briggs, Engineer-in-Chief, Nigerian Posts and Telegraphs Department. The Minister toured the factory and watched transmission equipment for Nigeria going through the works. The party was received by the group managing director, Dr. J. N. Aldington, and other directors.

Educational

The Birmingham College of Technology is organising a series of one-day conferences on electronic digital computers and their industrial appli-



Display by the North Western Electricity Board in connection with the Stockport centenary celebrations

cations. The first of this series, with special reference to Ferranti computers, will be held at the College at Gosta Green on 8th October. The conference fee (including luncheon) is £2. Further details and application forms can be had from the Registrar, College of Technology, Gosta Green, Birmingham, 4.

A six months' full-time course for the Institution of Electrical Engineers —Part III, and/or the Institution of Mechanical Engineers—Part C examinations commences in October at the South East London Technical College, Lewisham Way, S.E.4. Applications should be made to the Head of the Electrical Engineering and Applied Physics Department.

The prospectus for the 1958-59 session at the Sir John Cass College, Jewry Street, E.C.3, is now available.

E.M.B. Co.'s Jubilee

The E.M.B. Co., Ltd., West Bromwich, celebrates its jubilee this year and to mark the occasion it has issued a booklet outlining its history. The company was formed in 1908 to manufacture a tramway brake patented by A. W. Maley. The traction side of the business quickly developed and other tramway equipment was produced. With the decline of the tramways and their substitution by motor omnibuses, new products were introduced, including diecasting machines, injection moulders, resistances, control and contactor gear and air presses and valves. The booklet briefly describes these changes and developments and illustrates some of the early equipment and present-day products.

Stockport Centenary

The North Western Electricity Board staged two displays in connection with the centenary exhibition of Stockport, Cheshire, held from 7th to 12th July. One, in the Town Hall, was part of an exhibition showing how the various services in the town functioned. The Board's stand was mainly domestic and included not only new electrical equipment but also a 1911 cooker and other veteran examples of domestic kitchen apparatus. The Board's other display was at the Ministry of Works Building Exhibition in the Stockport College of Further Education. An exhibit on the Board's stand which attracted great attention was a model illustrating floor warming, planned by the Board's Display Department. Other sections dealt with kitchen planning, storage heating, wiring installation and building tools.

Price Reductions

Electro Methods, Ltd., announces reductions in the prices of its a.c. pneumatic time-delay relay type 500 and its miniature polarised relays.

Change of Address

The National Inspection Council for Electrical Installation Contracting has moved to Aldine House, 10-13, Bedford Street, London, W.C.2 (telephone: Covent Garden 1163/4).

Trade Announcements

An association has been formed between **Westool, Ltd.,** St. Helen's Auckland, Co. Durham, and **A. P. Besson & Partner, Ltd.,** Hove. Westool will act as sole selling agents for all relays, micro-components and sensing devices manufactured by A. P. Besson & Partner, Ltd.

Mr. H. Pickett, chief engineer of **Unity Heating, Ltd.,** is confining his activities to the districts covered by the Eastern Electricity Board as from 31st July. His address will be Norton Road, Tostock, Bury St. Edmunds, Suffolk (telephone: Beyton 378). The districts of Mr. Rose, the southern engineer, will be extended to include the South Eastern and Southern Sub-Area districts of the London Electricity Board. His telephone number is Hurstway 5220.

Polytetrafluoroethylene (P.T.F.E.) film is now available in England in an unsintered form permitting easy fabrication into a range of products which can be built up by lapping. It is supplied in the form of tape known as "Bonnytape" and is available in a range of colours, in widths from ¼in to 3in and in thicknesses from 3 to 10 thou from **Durham Raw Materials, Ltd.,** 1-4, Great Tower Street, London, E.C.3, sole selling agents for the manufacturers, Durham & Bonny, Ltd., Birtley, Co. Durham.

From 11th August **Kelvin & Hughes (Industrial), Ltd.,** will move its administrative offices from 2, Caxton Street, Westminster, London, S.W.1, to its new building at Empire Way, Wembley, Middx. (telephone: Wembley 8888).

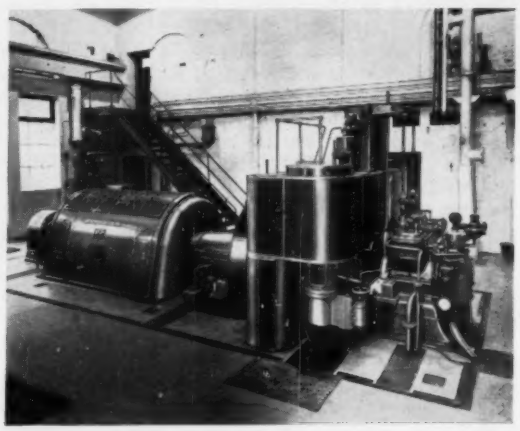
Grundig (Great Britain), Ltd., is moving on 26th July to new and larger premises at Newlands Park, Sydenham, London, S.E.26 (telephone: Sydenham 2211). The showroom and Publicity and Advertising Department remain at 39-41, New Oxford Street, London, W.C.1.

The address of Mr. H. R. Walker, representative for London and the Home Counties for the **Horstmann Gear Co., Ltd.,** is now "Reklaw," Raglan Road, Reigate, Surrey (telephone: Reigate 4669).

Cawkell Research & Electronics, Ltd., has moved into larger premises at Scotts Road, Southall. The telephone number remains Southall 3702/5881.

Fielden Electronics, Ltd., has established a Midland area office at 51, Bradford Street, Walsall, Staffs. (telephone: Arboretum 55343), under the management of Mr. F. B. Price.

The telephone number of **Luxram Electric, Ltd.,** is now Shoreditch 9272.



Manufactured by Metropolitan-Vickers Electrical Co., Ltd., this 6,448 kW back-pressure turbo-generator was recently put into operation at the Kynoch Works power station of Imperial Chemical Industries, Ltd., Metals Division

Load Factor in the Electricity Supply Industry

After referring to tariffs and peak load costs Mr. Bellamy reviews the steps already taken by the Boards to improve load factor and suggests lines for future action, emphasising the potentialities of thermal storage space heating

*Some Observations by Mr. D. Bellamy, O.B.E., D.L., Chairman, Yorkshire Electricity Board**

THE monopolistic rights for the public supply of electricity vested in statutory Boards carry with them the responsibility for giving this supply to the community where, when and how it is required and at the cheapest possible price consistent with sound economic principles. From the beginning continued efforts have been made to this end, but their efficacy has been questioned in such observations as: " Consumers should be made to take supply when we want them to and not when they want it," and " Consumers who create the peak load should pay much more for it "; or in more general terms " Why don't the Boards improve the load factor ? "

The situation creating these comments arises from the enormous development of electricity supply, requiring large doses of public capital, at a time when this commodity is scarce. This requirement is not new. Prior to nationalisation, a considerable degree of development occurred but the necessary capital was forthcoming. Capital expenditure on electricity supply formed 0·75 per cent of the gross national product in 1938 and 1·35 per cent in 1956. Expressed as a proportion of gross fixed capital formation the corresponding figures for the two years were 5·9 and 7·7 per cent. As a proportion of gross national product, capital expenditure on electricity supply has nearly doubled, but has only increased by one-third its share of the gross fixed capital formation. As electricity sales in 1956 were some 3·7 times their 1938 level, and as electricity is becoming increasingly important in the national economy, the proportion of national resources now devoted to capital formation in electricity supply appears to be more than fully justified.

In the pre-war years, with low coal costs, the fixed cost component of electricity supply at times reached 80 per cent of the total cost. Before the war, capital charges were, on average, more than 40 per cent of the annual revenue expenditure, but are now less than 30 per cent. Various factors have contributed to this reduction, including a material improvement in load factor. With nuclear production, there will be a transfer of some of what were formerly running costs to capital and probably a consequent readjustment of the ratio of fixed to running costs in the tariffs. Tariffs will still need to be directly related to cost and designed to attract and develop output competitively.

Changing the Habits of Consumers

On the question " Consumers should be made to take supply when we want them to," apart from statutory obligations, a public service under national control is expected to provide a community necessity when it is required. It cannot make sections of the people sleep in the daylight and work in the night; neither can it change the incidence of the natural combination of darkness and winter conditions. Financial incentive is not a determining factor, because electricity accounts for only 2½d out of every £ of domestic expenditure and only 1½d of every £ of industrial income.

The peak load arises from the two natural factors, light and temperature. There is no means of controlling the lighting peak, but efforts are made to ensure that the price correctly covers cost. On the other hand, technical progress now permits the use of storage methods for warming buildings with supplies taken off peak. An artificial market should, however, not be created by an unjustifiable biasing of prices.

Paying for the Peak Load

With regard to the observation " Consumers who create the peak load should pay much more for it," tariff construction is based on a correct allocation of peak-load cost adjusted to provide essential but reasonable margins of surplus. When then should peak-load consumers pay more ? They are the foundation of the source of revenue and most of them come naturally into the peak with their normal daily routine throughout the whole year. They do not come on just to create the peak, which is caused by seasonal heat and light during winter together with normal daily hours of activity. If any one consumer used electricity for any purpose for this period only, his average cost per kWh under any existing two-part tariff would be high. An additional charge inherent in the tariff structure is that a consumer class which shows relatively less diversity at peak-load times has a higher demand charge. For instance, in Yorkshire the first step in the low-voltage demand charge in the commercial two-part tariff is £6 15s per kVA per annum, whereas in the industrial tariff it is £5 per kVA per annum. This difference is because the commercial load is predominantly lighting with low diversity. Moreover, if the cost to peak-load consumers were increased artificially it could well result in the loss to competitive fuels of some of the electrical load which at present contributes effectively to load factor improvement.

The final question " Why don't the Boards improve the load factor ? " embraces to some extent the two former

* The full text is being published in pamphlet form by the Board, from whom copies will be available.

questions. In spite of the measure of control available, load factors outside the electricity supply industry are often low. The single-shift factory operates its plant at only about 20 per cent load factor. The large store may achieve 10 per cent or less. In transport, only very densely loaded rail routes reach 50 per cent and local road routes reach only about 30 per cent.

In general, load factor is a straight business issue and neglect of all possible measures to have it as high as possible would indicate lack of business acumen.

Pre-War Action to Improve Load Factor

In aiming at improvement, the major weapon has been one of prices. Fig. 1 shows a typical load curve in 1902 when electricity was used mainly for lighting. At this time a single flat rate was in use in many undertakings, but others were offering, in addition, a lower flat rate for heating and power in the hope of selling units at other times than the lighting peak. The Hopkinson method of two-part charging was also being developed. The success of these methods coupled with vigorous salesmanship led not only to rapid development but also to a considerable improvement in load factor and a consequent reduction in average price. The changed shape of the load curve is illustrated in Fig. 2, which shows that in 1925, even in a highly industrial area, the lighting peak still predominated, but that there was a large block of load away from the lighting period.

Straightforward two-part tariffs were suitable for industry, but a simpler form was desirable for the domestic load and rateable-value, room-basis or floor-area tariffs were introduced and became mainly responsible for the rapid domestic development in the late 1920's and throughout the 1930's. Many undertakings also operated special tariffs for encouraging loads with predominantly off-peak characteristics. In the area of the Yorkshire Electricity Board, which may be taken as typical, these tariffs, some of which were operating as long ago as 1920, were of three main types as follows:—

Two-rate tariffs, in which there was no restriction on the use of electricity, but the charging of a lower price for taking supplies during the off-peak hours of the day was relied upon to transfer some of the electricity demand to those periods. Tariffs of this kind were in existence covering such general uses of electricity as lighting, heating, cooking, fish frying and such large-scale industrial uses as flour milling, textile manufacture, quarrying, mining and electric furnaces. In the latter case, for example, electricity taken outside the periods 6 a.m. to 6 p.m. on Mondays to Fridays and 6 a.m. to 12 noon on Saturdays was charged at only 60 per cent of the normal rates.

Tariffs for special purposes having off-peak characteristics and high diversity, such as water heaters having lagged cylinders and thermostatic control and thermal storage systems generally.

Off-peak tariffs for consumers who agreed to their supply of electricity being cut off during definite hours of the day, during which the occurrence of the undertaking's maximum demand had a high degree of probability. Tariffs of this kind were often available for such uses as shop window lighting, battery charging, heating and motive power. In one undertaking the normal charge was halved if the supply could be disconnected between 4.15 and 5.30 p.m. in the last half of November and in January and between 3.45 p.m. and 5.30 p.m. in December. For larger power supplies where a two-part tariff applied, the maximum demand charge was reduced by £1 per kW or about 30 per cent in respect of the excess of that part

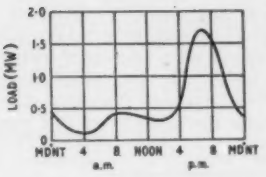


Fig. 1.—Winter daily load curve 1902 (Sheffield Undertaking)

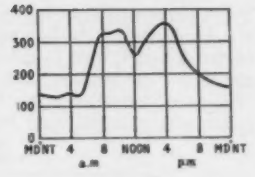


Fig. 2.—Winter daily load curve 1925 Mid East England Electricity Scheme

of the maximum demand in off-peak hours above the demand in peak hours.

All these special tariffs contributed to load factor improvement, but in many cases they succeeded mainly because they resulted in securing load which would not otherwise be obtained and which added to the general diversity; for instance, the furnace tariff referred to above assisted considerably the development of steelworks load. In general, the numbers of consumers and sales on these tariffs were relatively small and the main development resulted through attractive general tariffs.

As an extension of the principle of off-peak tariffs and assisted by technical developments, several undertakings introduced cheap tariffs for special loads, chiefly water heating, which could be switched off by remote control at times when the undertaking load approached its peak. These systems were not particularly successful, however, on account of technical complexities and on account of the fact that the appeal of a low price was not strong enough to overcome the consumers' objection to possible disconnection at unspecified times. Furthermore, if adequate heat or hot water storage facilities are available the additional flexibility afforded by remote control in relation to systems using time switches is of little value.

The first part of Fig. 3 shows approximate load factors from 1920 to 1947-48. They are not true load factors in so far as they are based on the Electricity Commissioners' returns, which give the aggregate maximum demands for all undertakings, but they are self-consistent and reveal a steadily increasing load factor throughout the 1930's. It is important to consider this against the background of sales development, especially in regard to the two main classes, industrial and domestic, as shown in Tables 1 and 2.

Development from 1938 to 1947-48 was, of course,

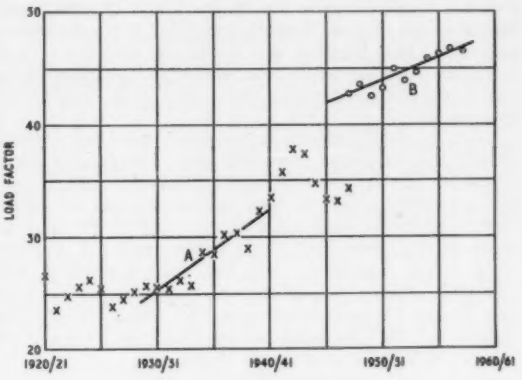


Fig. 3.—Trends of load factor

A Load factors based on aggregate demands for all undertakings.
B Load factors based on national simultaneous demand corrected for load spreading and shedding and adjusted to average weather conditions.

considerably influenced by war conditions, but the reducing dominance of the industrial load and the rapid growth of the domestic load in the 1930's were associated with a significant increase in load factor. In one undertaking (Kingston-upon-Hull), where a vigorous domestic sales policy was pursued, load factor increased from 35·8 per

TABLE 1

	Percentage of Total Sales	
	Domestic	Industrial
1920	8	70
1930	17	58
1938	26	50
1947–48	35	49
1956–57	31	51

TABLE 2

	Average Annual Growth Rate, per cent		
	Domestic	Industrial	Total
1920 to 1930	17·8	7·5	9·3
1930 to 1938	16·9	8·5	10·5
1938 to 1946	10·2	7·0	6·9
1947–48 to 1956–57	6·9	8·8	8·4

cent in 1929-30 to 42·1 per cent in 1938-39, whilst in the same period the proportion of lighting, heating and cooking units increased from 15·5 to 38 per cent of the total sales. Although ordinary tariffs, assisted to some extent by off-peak or other tariffs, were the chief means by which sales were increased, with the effect of increasing diversity and thus increasing load factor, arrangements with large consumers to reduce load on request or to generate their own peak-load supplies also assisted.

Post-War Action to Improve Load Factor

The peak-load problem was brought into prominence by the shortage of generating plant immediately after the war, which had its maximum effect in 1950-51 when load was shed on 267 occasions, the maximum figure being 2,109 MW or 15·8 per cent of the total. There has not been a serious measure of load shedding since 1954-55, but there is no doubt that these continued cuts (or failing to give the consumers what they wanted at the time they required it) severely retarded development.

Steps taken to reduce peak loads included the staggering of industrial working hours, which was to some extent effective but proved extremely unpopular and was abandoned as soon as possible. A further measure was the adoption for the winter of 1948-49 of a seasonal domestic tariff, the price during the winter quarter being increased with a compensating reduction in the following quarters. This measure was ineffective and the failure to reduce consumption in the winter quarter resulted in substantial surplus revenue which had to be reimbursed to consumers.

Since 1947-48 domestic development has been slightly slower than industrial. Nevertheless, an overall growth of 106 per cent has been achieved and, with it, an increase in load factor. This is illustrated in the part of Fig. 3 dealing with this period in which the figures for 1947-48 onwards are true load factors corrected for average temperature conditions and for load spreading and shedding, which makes them not strictly comparable with the figures for earlier years. The industry's present policies are thus producing a load factor increase though at a rate slightly less than in the 1930's.

Further Possibilities of Improvement

There are three ways of improving load factor:—Encouraging an extension of the hours of use of those whose demands necessarily, by reason of seasonal or working conditions, form part of the maximum demand: endeavouring by negotiation to get such users to keep their demands as low as possible and developing all kinds of demands for different purposes, introducing an extended diversity of use.

The only incentive that the electricity industry can offer is the financial one. Experience has shown that the tariff structure must consist of two parts—the first part to cover the maximum demand cost and the second part a scale for actual units consumed. Such a tariff automatically encourages extended use of the supply because the lowest unit rate on the scale represents the lowest possible price at which the commodity can be supplied and if for the same one-hour demand the consumer extends his hours of use, he pays for his additional electricity at this low unit price only.

Take as an example an industrial concern working eight hours a day with a maximum demand of 1,000 kVA at £6 per kVA, plus ¾d per unit. A 44-hour week would give a load factor of approximately 25 per cent if the full demand were continuous during the working hours. Table 3 summarises the effect of change-over to double-shift working using the same demand.

This means that, *as against a single shift*, the consumer would get double his output and save in relation to this output about £6,000 because he has used the same demand for twice the period. Per unit of output, electricity costs would be reduced by 23 per cent. The saving of approximately £120 per week would, however, be very small compared with that due to the use of the whole of his assets for 80 hours against 40 and his overheads spread over twice the output. If his business permitted this, it would not be the electricity price which would determine it. On the other hand, if he has two shifts for the same output and halves his existing demand, he would save only £3,000 per annum, i.e. £60 per week, but what is this against half his assets being idle for the period, the additional cost of labour, etc., and all the inherent difficulties of shift working and supervision ?

TABLE 3

	Single-shift	Double-shift
Load factor, per cent	25	50
Units consumed	2,190,000	4,380,000
Total bill	£12,850	£19,700
Average price per unit	1·41d	1·08d

The Census of Production shows that materials and fuel account for 61 per cent and wages and salaries for 22 per cent of the value of industry's total production, the balance of 17 per cent comprising capital charges, profits, overheads, taxes and miscellaneous items. Electricity is included in the 61 per cent representing materials and fuel but, in fact, it represents only 0·64 per cent of the value of the product. Assuming that fixed costs in industry represent 8 per cent of total costs (based upon half the 17 per cent referred to), double-shift working should save fixed costs amounting to about 4 per cent of the value of the product. Clearly, therefore, any incentive which could be given by electricity tariffs is negligible in relation to the incentive already present in the industrialists' own fixed costs.

Apart from these aspects, there is also the question of what could be achieved. In Yorkshire, which may be taken as typical, about one-half of the industrial load consists of continuous or semi-continuous processes, and peak-load reduction by change-over to double-shift working would be limited to about 300 MW or 15 per cent

of the peak load. This would increase the load factor of the Board from 48 to 56·5 per cent.

Apart from consumers with standard supplies, however, more elastic demands have been dealt with throughout the country in one of the following ways:—Low unit rates for usage which is completely off peak periods; concessions in price to large users who can reduce peak demands regularly or on request, covering also seasonal demands; temporary use of private plants which have been superseded by public supply; installation of apparatus for power factor improvement.

When dealing with these off-peak conditions, several factors must be considered. For instance, in standard tariffs the effect of the diversity of individual demands in the creation of the peak is fully allowed for. This means that all consumers who create a demand which does or can form part of the supply peak pay their proportionate part of the cost. Consequently, there is a resultant period when the plant and equipment for which they have paid is idle. There is thus available what might almost be termed a " by-product "—electricity at the running cost only. At such a price electricity would be *exceptionally* cheap in any economically *competitive* market, but is it equitable, to those consumers who have paid the charges on the idle plant, that it should be " given away " at this price when it is unnecessary to get to such a low level to compete economically with alternative sources of light, heat and power? Moreover, in addition to the generation peak, there is a distribution system peak which is sectionalised into smaller quantities. The possibility of overloading the system and incurring additional expenditure to meet the capital cost of reinforcing it must be considered.

For these reasons the essentials in any off-peak tariff are: where such tariffs provide supplies at the lowest unit rate only, they must be confined to consumers who have paid their proportion of peak-load costs for normal use; where this factor does not apply, i.e. where the load consists of summer, seasonal or special off-peak time demands only, the tariff must make provision for increase in the distribution peak cost, or an amount covering some proportion of the cost of the peak assets, because *without those having been paid for by other consumers,* the supply could not be afforded at running cost only.

Undoubtedly one of the greatest potential fields for off-peak development lies in storage space heating. As developed in the 1930's, hot water was stored in heavily lagged tanks and circulated through conventional systems. These systems took advantage of low off-peak prices, but capital costs showed no savings over other fuels.

Since 1950 two main alternative methods have been developed: first, the self-contained block-storage type in which heating elements are surrounded by fireclay blocks which store the heat; secondly, under-floor warming in which heating cables are incorporated in the concrete floor which itself acts as the storage medium. In both methods heat continues to be emitted after supply to the cables has been switched off.

The self-contained block storage heater is more conveniently installed in existing commercial and industrial buildings, and in 1956 20,000 were sold, but the number has increased materially since then. Capital costs are slightly in excess of those for direct electrical heating, but compare favourably with those of other fuels, while running costs are competitive.

Since its very satisfactory use in blocks of flats in Kirkcaldy, development of floor heating for domestic space heating has been extremely rapid and many local authorities have adopted it for large blocks of flats and ordinary houses. For commercial and industrial use the method presents an extremely attractive means of heating from all standpoints, especially for new factories where the presence of steam raising equipment is now exceptional.

TABLE 4.—OPTIMUM LOAD FACTOR 1957–58, PER CENT

Maximum theoretical load factor		100
Reductions due to—		
Load growth	3·7	
Plant non-availability	8·9	
		12·6
		87·4
Reductions due to—		
Load depression at week-ends	7·5	
Load depression at Bank Holidays, etc.	2·5	
		10·0
		77·4
Reductions due to—		
Seasonal variations beyond those equivalent to variation of plant availability	12·4	
Variations between weekdays	4·3	
Variations of load during the day	12·6	
		29·3
Actual load factor		48·1

The actual load factor (48·1) is 62·2 per cent of the optimum (77·4) having regard to load growth, plant availability and present pattern of holidays.

Taking into account the absence of boilers, accommodation, flues, pipework and fuel storage space, both block storage and floor warming will generally result in substantial savings in capital cost. Recent installations in the latter case have shown savings between 30 and 45 per cent of the cost of conventional systems. Added to this is complete freedom for interior planning together with the absence of operating labour and the minimum of maintenance. Rewirable systems which would facilitate replacement of faulty heating cables, if ever found necessary, are available.

Because of the large extent of new housing, attention has been mainly devoted to the domestic field and in association with storage water heating it is possible that for every 100,000 dwellings equipped with floor heating and water heating the present percentage load factor would be increased by about 0·5. Where installations are concentrated in groups such as blocks of flats or housing estates it is probable that distribution capacity substantially greater than present normal standards will have to be provided involving greater proportionate capital costs because of the low diversity of this load in relation to known diversities of existing loads.

Outside the domestic field the method presents an extremely attractive means of heating from all standpoints and there is considerable scope for development in commerce and industry.

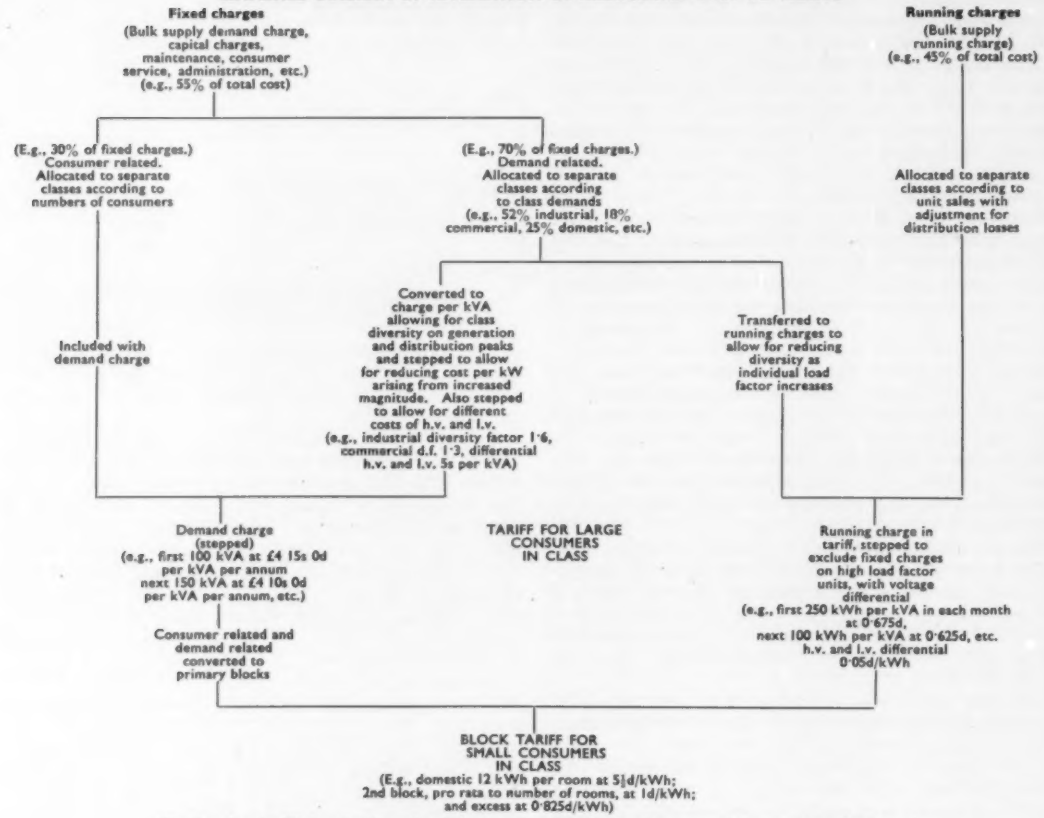
Conclusion

The present method of computing load factor throughout the country, which gives 48·1 per cent for 1957-58, is misleading as it is based upon the percentage of actual use of the recorded peak demand over the whole of the 8,760 hours in the year. On a more rational assessment it represents 62·2 per cent of a possible reasonable optimum, which allows for the factors indicated in Table 4.

From the industry's early days efforts have been made to improve load factor and our present practices and tariffs make for further improvement. That the need for an increased use of assets otherwise idle is fully realised is evidenced by the considerable volume of research constantly carried out by the Utilisation Research Committee in association with Area Boards, with a view to providing information about load characteristics to enable the most effective policies for development to be determined; by the further development of tariff policy to encourage load factor improvement; and by publicity and personal contact with consumers with a view to

APPENDIX I

SIMPLIFIED DIAGRAM OF APPLICATION OF AREA BOARD COST TO TARIFFS


Fixed charges
(Bulk supply demand charge, capital charges, maintenance, consumer service, administration, etc.)
(e.g., 55% of total cost)
Running charges
(Bulk supply running charge)
(e.g., 45% of total cost)
(E.g., 30% of fixed charges.)
Consumer related.
Allocated to separate classes according to numbers of consumers
(E.g., 70% of fixed charges.)
Demand related.
Allocated to separate classes according to class demands
(e.g., 52% industrial, 18% commercial, 25% domestic, etc.)
Allocated to separate classes according to unit sales with adjustment for distribution losses
Converted to charge per kVA allowing for class diversity on generation and distribution peaks and stepped to allow for reducing cost per kW arising from increased magnitude. Also stepped to allow for different costs of h.v. and l.v.
(e.g., industrial diversity factor 1·6, commercial d.f. 1·3, differential h.v. and l.v. 5s per kVA)
Included with demand charge
Transferred to running charges to allow for reducing diversity as individual load factor increases
Demand charge (stepped)
(e.g., first 100 kVA at £4 15s 0d per kVA per annum
next 150 kVA at £4 10s 0d per kVA per annum, etc.)
TARIFF FOR LARGE CONSUMERS IN CLASS
Running charge in tariff, stepped to exclude fixed charges on high load factor units, with voltage differential
(e.g., first 250 kWh per kVA in each month at 0·675d,
next 100 kWh per kVA at 0·625d, etc.
h.v. and l.v. differential 0·05d/kWh
Consumer related and demand related converted to primary blocks
BLOCK TARIFF FOR SMALL CONSUMERS IN CLASS
(E.g., domestic 12 kWh per room at 5½d/kWh;
2nd block, pro rata to number of rooms, at 1d/kWh;
and excess at 0·825d/kWh)

The above is a simplified explanation and excludes a number of details taken into account in its practical application.

encouraging the most effective use of electricity from the consumers' and the supply industry's standpoints. Furthermore, the whole problem has been recently examined and reported on in detail by the Off-Peak Tariffs Sub-Committee of the Retail Tariffs Committee. It is the purpose of these observations to explain the efforts of the industry and the consequent existing tariff structures which provide all the financial attraction possible for extended development with continuing load factor improvement.

APPENDIX

Terms for Off-Peak Supplies, Yorkshire Electricity Board

Restricted Hours Tariffs

Available to consumers taking ordinary supplies on the Board's published tariffs for parts of their installations which are separately wired and used only outside prescribed hours. There are two tariffs, the first being a flat rate with a basic unit charge of 0·775d per unit (0·05d per unit less than the final rate in ordinary block tariffs), this basic unit charge applying where the prescribed hours are a maximum, i.e., 7.00 a.m. to noon and 3.00 p.m. to 6.00 p.m. on weekdays throughout the year. A scale of additions to the basic unit charge is provided for reductions of the prescribed hours. A second tariff has a lower unit charge, 0·60d for low voltage supplies and 0·55d for high voltage supplies corresponding to the final rate in ordinary two-part tariffs, together with a demand charge for demands of the separately wired restricted hours supply in excess of the normal supplies. Since their inception in 1953 development of sales on these tariffs has been rapid and amounted to 38 million units in 1957-58 (an increase of 50 per cent over the previous year). Leeds Corporation have in hand a scheme for some 1,500 flats to have space and water heating supplied by electrical thermal storage methods on the restricted hours tariff.

Special Agreements

In addition to the tariff there are special agreements with some 80 industrial consumers with loads totalling 65 MW providing for reduced demand charges for some 20 MW of load taken solely in off-peak hours.

Also five very large consumers curtail demand in the winter months and in emergency by approximately 20 MW in total.

Sandwich Courses

A NEW list of approved sandwich courses in technical colleges has recently been published by the Ministry of Education (H.M. Stationery Office, 1s 6d). It gives details of 263 courses of this type to be held during the 1958-59 session—65 more than were approved for the preceding year.

There are now 144 courses—21 more than last year—available at colleges of advanced technology and regional colleges. About a third of these lead to degrees or diplomas in technology, and the remainder to other high qualifications which in many cases give exemption from the examination requirements of professional bodies in the field of science and technology.

Sandwich courses offered at other technical colleges have also increased from 75 to 118. Many new subjects are offered, including various branches of engineering. About half the courses in the group are intended to lead to the Higher National Diploma.

NEW ELECTRICAL EQUIPMENT

Food Mixer

An electric food mixer has been added to the range of domestic products manufactured by MORPHY-RICHARDS, LTD., 50, Conduit Street, London, W.1. It is a portable model, weighing just over 2 lb, and is provided with two sets of beaters—a pair of whisks for mixtures of thin consistency and a pair of paddles for heavier mixtures. Measuring only 6½in in length, it is designed to fit in the palm of the hand, while the thumb rests near the on-off switch. The casing is of plastic in three colour finishes—all ivory, two-tone ivory and red, or two-tone ivory and blue.

The loading is 60-70 W and models are available in three voltage ranges, 200/220, 220/240 and 250/260. The price is £6 19s 4d plus £1 10s 2d purchase tax in the United Kingdom.

Printed Circuit Connectors

The range of precision printed circuit connectors made by ELECTRO METHODS, LTD., Caxton Way, Stevenage, Herts., has been extended by the introduction of the Series BK and BKM. These have been produced to meet the demand for a connector which will accommodate a printed-circuit card based on 0·1in grid. The Series BK, with contact-centres 0·2in, are available with 8 and 12 contacts and the Series BKM, with contact-centres 0·1in, are available with 17 and 25 contacts. These connectors, which are interchangeable, have end-fixing and polarising-pins which can be fitted in any position. A choice of contact terminal is available.

Electro Methods have also introduced a transistor holder and connector, based on their Series M plug and socket, which has been especially adapted to carry several of the Mullard transistors, Series OC, OCP and 2N.

Automatic Welding Equipment

Welding equipment with a very sensitive control system is announced by ROCKWELD, LTD., Commerce Way, Croydon, Surrey. The "Autopak" is a robust, versatile machine for the fabrication shop. It is portable and easily operated. When not fully employed in running automatic submerged arc welds it is available for hand welding with ordinary coated electrodes.

The automatic control equipment consists of components associated with the transformer which are used to feed and control the automatic welding head. There are no electronic components. An adaptation of the twin motor control system has been used for a drive unit for the welding head carriage. This form of drive provides a 25 to 1 continuous speed variation.

The unit's well-protected welding head has been designed to take continuous wire feed when powered by the "Autopak" transformer. It is intended mainly for submerged arc welding. The standard head and rolls take $\frac{5}{32}$in, $\frac{1}{8}$in, $\frac{5}{32}$in, $\frac{7}{32}$in and $\frac{1}{4}$in diameter bare coppered-steel wire. Special rolls can be fitted to accommodate other processes and wires.

Welding Generator

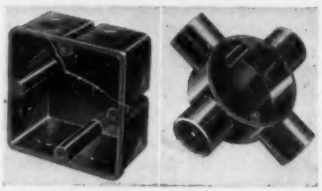
The latest addition to the range of diesel-driven welding generators made by QUASI-ARC, LTD., of Bilston, Staffs., is the type DEB.400. The set has a quick voltage recovery and is suitable for depositing cellulose-covered types of electrodes. The equipment is claimed to give suitable arc conditions when used for pipe welding with all ferrous and non-ferrous types of electrode.

Either Ford or Perkins engines are available and the equipment has a hinged roof which allows day-to-day maintenance to be carried out without the canopy being dismantled, and a lockable cover to protect the controls from any interference.

All controls are grouped at one end and the equipment is available as a static unit or on two- or four-wheeled road-towing gear.

Conduit Fittings

It is announced by EGA ELECTRIC, LTD., Holyhead Road, Wednesbury, Staffs., that two new lines have been added to their range of "Egatube" non-metallic conduit and fittings. They comprise 3/13 A switch boxes and 1in



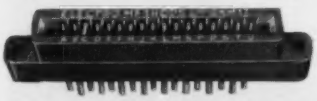
Ega Electric non-metallic switch box (left) and ceiling rose box

ceiling rose boxes with 1-, 2-, 3- and 4-way and back outlet entry. Full details and prices are available from the manufacturers.

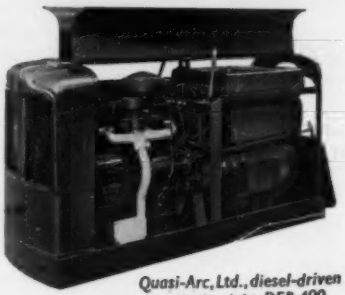
Electric Cooker

Designed to suit the average sized family, the new "Revo-Luxe" electric cooker, announced by the REVO ELECTRIC CO., LTD., Tipton, Staffs., has many distinctive features, including an eye-level control panel, glass splashback and contemporary design. The control panel, supported on two pillars which enclose the wiring, carries the switches for hob equipment and oven and also a remote-

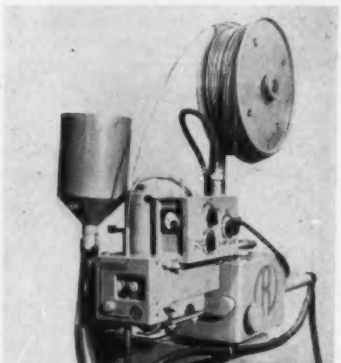
Morphy-Richards lightweight food mixer



Electro Methods printed circuit connector BKM17



Quasi-Arc, Ltd., diesel-driven generator type DEB.400

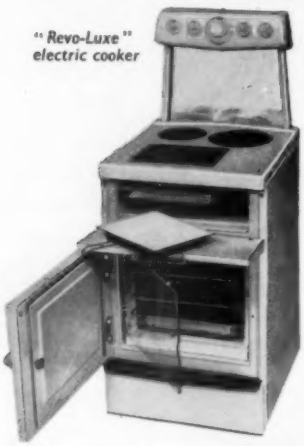


Rockweld "Autopak" welding equipment

control timer. The toughened glass splashback, detachable for cleaning purposes, is hooked into position beneath the panel.

The hob equipment comprises a 6¼in plate and an 8in plate (enclosed or radiant) with a 10½in by 8in grill boiler. The grill chamber and hot-cupboard is fitted with a drop-down door and provided with a vitreous enamelled grill pan with chromium handle.

The oven has a capacity of 2,900 cu in and is heated by tubular type elements at each side and the bottom (total oven loading 2·1 kW). It also has an inner glass door and the oven



"Revo-Luxe" electric cooker

interior can be lifted out for cleaning. Oven furniture includes two plated rod shelves and a special meat tin which can be used on the side runners. A roomy storage drawer is fitted at the base.

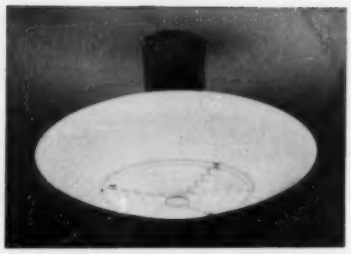
The construction of the cooker is of sheet metal and a vitreous enamelled finish is used for both outside and inside surfaces. It is 21in wide by 23in deep, the overall height being 53in (36in to the hob). The total loading is 7·1 kW and the body finish is in white or cream. There is a choice of colours for the hob and control panel with handles to match.

The price of the standard model, with timer-control, is 47 gns, and without timer-control, 43 gns.

Lighting Fittings

The main feature of the "Ellipse" series of lighting fittings announced by the MERCHANT ADVENTURERS, LTD., 16-43, Portland Road, London, W.11, is the slimness of the white opal glasses and their elliptical shape, providing efficient and shadowless lighting with low apparent brightness from the normal angles of vision.

The metalwork is in 16 gauge aluminium, anodised satin silver or pale gold, and the simple construction involves no screws or levers for securing the glass. The range consists of five sizes of glass from 10 to 22in in diameter, available either totally enclosed or with louvred apertures.



Merchant Adventurers Type MA.1525C-1529C "Ellipse" off-ceiling lighting fitting with louvred aperture

These are used with alternative mountings—recessed, flush to ceiling, off-ceiling, wall bracket, tube pendant, and cord pendant designed in two forms for use with vertical or horizontal lamps.

In addition, reflectors from 16 to 32in in diameter, finished in a range of attractive stove enamelled colours, provide an extension to the basic range numbering 120 units in all.

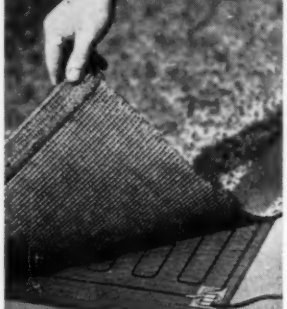
The prices, together with full details including dimensioned drawing (list E.1500) may be obtained from the company.

Dummy Fuses

Produced primarily for the aircraft industry, a range of dummy fuses is being manufactured by HELLERMANN, LTD., Crawley, Sussex. Frequently, where allowance has been made for future wiring, etc., fuses are not in use, and where there are gaps there is the danger that new fuses may be placed, or old fuses replaced, in the wrong positions. This may be avoided by placing dummies in all vacant positions. The dummies bear the words "Not in Use" and are coloured red for easy identification. So that a dummy may be detected in the dark, the stems are serrated. There are four sizes, 2, 2·5-5, 10 and 40 A, and prices and samples may be obtained from the manufacturers.

Heated Carpet Underlay

An electrically heated carpet underlay, for placing between the underfelt and carpet to provide a form of background room heating, has been placed on the market by ISOPAD, LTD., Barnet By-Pass, Boreham Wood, Herts. Designed for use on a 220/240 V mains supply, the heater has a loading between 800 and 900 W and measures 9ft by 6ft. It is provided with 9ft of strong flexible, enabling it to be plugged into the nearest socket-outlet. The price is £12 10s plus £2 4s 10d purchase tax in the United Kingdom. For larger surfaces two or more of these standard units can be used.



Isopad electrically heated carpet underlay

Floor Warming System

A solid embedded electric low temperature radiant floor warming system utilising p.v.c. covered heating cables has been introduced by PANELEC (GREAT BRITAIN), LTD., 21, Bloomsbury Street, London, W.C.1. The cables are held in position by a patent plastic spacer bar which is slotted at frequent intervals, and secured to the sub-floor at each end of the room. The cables are then looped through the bar at whatever centres are required over the entire floor area.

The cables are supplied in units of ½, ¾, 1, 1½ and 2 kW, each having an approximate loading of 3·75 W ft/run. They can also be supplied with a metallic earth screen consisting of open braid tinned copper wire and all the cables are provided with factory jointed 12ft cold tails. The centres at which cables are to be laid are determined by the required load and the floor area, but for normal building construction 3¾in can be taken as an average space between the cable runs.

The system is normally controlled by air thermostats mounted on the wall in suitable positions, but, if required for intermittent use or for local heating, thermostats of the cartridge type or with the phials of remote control instruments located in the floor, are recommended.

Low Temperature Heaters

New prices have been announced for several of the Midland Electric Manufacturing Co.'s range of heaters which were listed in our survey of low temperature heaters published in last week's issue (p. 130). Details of the changes are as follows:—"Rotovair" (now finished in walnut only), £9 10s plus £2 1s 8d purchase tax; "Memvek" portable model, £6 10s plus £1 8s 6d (switch) and £7 8s plus £1 12s 6d (thermostatic); "Memvek" wall mounting model, £5 17s plus £1 5s 8d (switch); "Memrad" (without drying rail), £6 3s plus £1 7s.

Additions to the range include a 3 kW version of the "Memvair," £13 12s plus £2 19s 8d (switch) and £14 7s plus £3 3s (thermostatic); 3 kW "Memvek" portable model, £10 7s plus £2 5s 5d (switch) and £11 2s plus £2 8s 8d (thermostatic); 3 kW "Memvek" wall mounting model, £9 13s plus £2 2s 4d (switch) and £10 8s plus £2 5s 8d (thermostatic).

International Electricity Supply

In our last issue we gave an account of the proceedings of the first part of the triennial Congress of the International Union of Producers and Distributors of Electrical Energy (UNIPEDE) held recently at Lausanne. The remaining 25 papers are discussed in this issue and the topics covered include hydro-electric generation, pumped storage, international interconnections and distribution.

THE 1958 UNIPEDE CONGRESS

FROM A CORRESPONDENT

WHEN he opened the session dealing with economic conditions in multi-purpose hydraulic developments M. P. Delattre[9] (France) presented a general report. He began by pointing out that the recent development of fresh sources of energy had opened up new prospects and it could now be confidently predicted that mankind would never suffer from lack of energy. At the same time it was becoming essential that hydro-electric schemes which covered entire river basins, often of very great area, should be integrated into the general programme for the development of these valleys or river basins, which would also include protection against floods and the utilisation of the water as required for navigation, irrigation, town water supply, etc.

Three main considerations arose: technical, legal and economic. The last was often the most difficult for, in view of their magnitude, multiple-purpose schemes often involved participation by the state, and the hydro-electric operator might therefore sometimes be faced with the loss of some of his independence. The author pointed to the difficulties involved in achieving a reasonable division of costs between the operator and the public authorities which would not distort the economics of the scheme. In many cases, however, multi-purpose projects were clearly required in the public interest, and the operator of a hydro-electric concession had no alternative but to accept this situation. Certain large schemes could in any case only be developed through close co-operation between the grantor and the operator of the concession.

Pumped Storage Plants and their Relation with Hydro and Thermal Stations.—This report by Dipl.Ing. W. Pietysch[10] (Germany) and Sr. F. Ivo Goncalves (Portugal, for the chapter on the situation in Portugal) dealt with the use of pumped storage for the utilisation of excess energy in the case of the interconnection of hydro-electric stations with important thermal power stations for daily, annual and inter-annual regulation. It was indicated that pumped storage could only be used within very narrow economic limits. Very special conditions were required if pumped storage were to be employed to utilise excess energy for either annual or inter-annual regulation. The present report dealt first with the problem of the peak demand for electrical energy which was encountered in every country. The development of pumped storage in Germany, which started as early as 1908, was used to demonstrate the factors determining design and the effects of pumped storage in Germany were then discussed. The situation in Portugal differed so much from that in other countries that the Portuguese report had been included in its entirety as an example to show that pumped storage could also be used for the solution of problems differing widely from those encountered in Central Europe. Portugal, which relied mainly on hydro-electric power, did not yet possess any pumped storage stations, but it was possible that extensive schemes involving annual or inter-annual storage would be constructed after 1961. The forecast of electrical energy requirements in Portugal included not only the output of the future pumped storage plants but also took into account the nuclear stations planned there.

France, on the other hand, did not envisage the construction of pumped storage installations either at present or in the future; it was stated that there was no surplus of hydro-electric power, while the amount of fuel available for thermal power stations was not sufficient to permit the application of pumped storage.

The analysis of the size and economics of pumped storage plants was based largely on German theoretical work from which two calculation formulæ were produced.

Capacity of Hydro-Electric Stations in Interconnected Systems.—Starting from the load curve and extrapolating over the next 20 or 30 years, an attempt was made to determine, as far as possible, the conditions which would have to be met in the more or less distant future. This, reported M. F. Aemmer[11] (Switzerland), led to the determination of the capacity of hydro-electric stations when planning their inclusion with large thermal stations (conventional and nuclear) in the operation of interconnected systems.

In the particular case of Switzerland, the first step would consist of utilising all the hydraulic resources which could be harnessed economically and then making up the balance with nuclear power stations which, by then, would probably have passed the experimental stage. The adaptation of means of generation to the load curve was considered in greater detail by taking into account the reduction in available water power in dry years and the reserves of capacity necessary for each mode of generation and the transmission systems. It was thus possible to estimate the theoretical optimum plant at

which it was necessary to aim in order to be able to exploit the available water power to the best advantage. In addition, some figures were given on the increase in the cost of construction of hydro-electric stations in relation to the increase in the installed capacity.

Such a study had been made for Portugal and it was interesting to find a great similarity in the conclusions arrived at in the case of Portugal and Switzerland.

Quality of Hydro-Electric Energy. — Dott.Ing. C. Marcello[12] (Italy) gave a report on the determination of a quality index for the different forms of hydro-electric energy. In it he described a basis for determining the quality of energy in relation to consumer requirements and production difficulties. As an example of the meaning of "quality" in this context Dr. Marcello instanced the fact that in a thermal power station the consumption of a certain weight of coal resulted in the same costs irrespective of whether it was used in summer or winter, these costs depending only on the price of coal. [This statement would appear to be not altogether true.—Ed.] As a result, the cost of a thermal kWh was the same in winter as in summer. The same did not apply to a hydraulic kWh. While the energy demanded by the consumer remained almost constant or varied only slightly throughout the year, the natural hydraulic resources were subject to violent fluctuations, these sometimes being of a rather random nature.

Under these conditions the producer of hydro-electric energy was forced to value the energy differently, depending on the season during which the energy was required. This type of quality depended on the relative difficulty of generating the energy, and not on the demand. The main conclusion was that, particularly for Alpine regions, energy stored in reservoirs was worth between two and three times as much as regulated energy and at least four times as much as run-of-river energy.

International Interconnections.—The work of the committee was introduced by the chairman, Dott.Ing. G. Riccio[13] (Italy), who referred particularly to the problems of all kinds arising out of the construction in many countries of networks operating at over 220 kV. The duty of the committee was to study general aspects of such developments and the existence of other international bodies enabled UNIPEDE to initiate more thorough examinations of the problems being studied.

It was necessary to stress the exceptional technical character of the construction and commissioning of 380/400 kV networks to function with perfect regularity. Until a few years ago some doubt was expressed—even in highly qualified technical circles—in regard to the possibility of installing such lines in densely populated areas. These doubts had now become groundless as the problem of installing 380 kV lines in any area had already been solved in its main points. It was also pointed out that the trend towards very high voltages was not limited to countries like Sweden and the U.S.S.R., where great distances had to be covered, but was also found in countries where the distances were only medium and even very small. Due to the problems raised by passing very-high-voltage lines through densely populated areas, it could be easily understood that the reduction in space required was a strong argument in favour of 380 kV lines, even if they were not made imperative by the distances over which the power was transmitted.

International interconnections at the present time consisted to a great extent of 220 kV lines, a few lower-voltage lines, and in one case only of a 380 kV line, which, moreover, was operating for the time being at 220 kV. There was no doubt whatever that the 220 kV international interconnection network was sufficient for present purposes. On the other hand, the new 380 kV lines in various countries tended, because of natural conditions, to converge towards areas supplying distribution centres or where large quantities of hydro-electric power were used. This meant that in some cases 380 kV interconnections were comparatively easy. When, in a few years' time, the 380 kV networks in countries generating more electricity than others were superimposed on the 220 kV networks, international interconnections limited to 220 kV would constitute a sort of bottle-neck and the reserve supply would lose the elasticity which was one of the most important features of international interconnections. This led to the conclusion that 380 kV international interconnection could, in the more or less near future, be of great advantage to the various countries concerned. The arrival of the era of nuclear power generation would in no way affect the foregoing considerations.

Economic Problems in Connection with E.H.V. Lines.—Messrs. Cahen and Dejou[14] (France) had carried out a comparative study of the construction and operating costs of e.h.v. lines. The parameters which had to be taken into account were so numerous that the authors had made use of electronic calculating machines. The authors found that the choice of bunches of two, three or four conductors per phase depended on extremely small differences in cost. This partly explained the diversity of the solutions so far adopted and brought out favourable features of some of them which would otherwise have been overlooked.

In regard to twin circuit lines it was recommended, in general, that both circuits be installed at the time of construction rather than delay the installation of the second circuit. This view was somewhat contested during the discussion by a speaker who said that in Belgium at least, with their different interest rates, the opposite was true.

Production and Distribution of Reactive Energy.—When the cost of reactive power was estimated for comparison of the various means of production available, multiple solutions were found which were not all equivalent from the technical point of view, each having some special characteristic which distinguished it from the others. This report, by Messrs. Lalander, Gustavsson and Holmin[15] (Sweden), examined all these characteristics and, for each solution, suggested its field of use, profitability limits and cost. The authors also pointed out the advantages of forecasting the possible increase in consumption of reactive power, of constituting appropriate reserves of reactive power, and urging consumers to make the most suitable arrangements.

Degree of Safety of H.V. Overhead Lines Against Lightning.—Messrs. Rietveld, Provoost and Suyver[16] (Netherlands) reported on experiments made at the KEMA laboratory at Arnhem and on other research by its authors. Numerous studies had already been made on small-scale models to determine what area was effectively protected from lightning strokes. These led to conclusions which, although similar in substance, could not be given a common interpretation. The experiments at the KEMA laboratory, on the other hand, allowed these differences to be explained by the special conditions under which each of them was made and enabled a general criterion to be established not only synthesing but completing all the former studies.

For the purpose of comparing their tests with actual practice, the authors mentioned the results of world statistics and proceeded to demonstrate that the degree of safety varied according to the angle of protection.

Interconnection between France and Great Britain.—This report by Mr. F. J. Lane[17] (until recently deputy chief engineer (transmission) with the C.E.G.B. and

now a partner of Preece, Cardew & Rider) and M. Cahen (France) reviewed the reasons justifying an interconnection between the French and British electricity supply systems. The development of the project was outlined, commencing with the factors which influenced the final decisions. Then followed a description of the technical problems peculiar to a submarine cable and the investigations and development work carried out to resolve them. The report referred to the alternating current scheme on which the original investigations were based and to the direct current scheme which was finally adopted. Details were then given of the operational features of the interconnection and the financial advantages of the d.c. scheme. The report concluded by referring to possible future extensions, increase in load capacity and the possible extension of the d.c. feature towards the generation centres of Western Europe.

DISTRIBUTION

Operating Costs of Power Distribution Networks in Large Cities.—In this report by Dr. Ing. E. Schulze[18] (Germany) the results were given in an anonymous form of an investigation into the operating costs of distribution networks in 21 large cities. Beginning with the specific distribution costs for six German cities in the year 1954, the investigation was then extended to 21 cities over a number of years, and the manner in which the specific distribution costs varied was determined. An investigation of the types of cost—such as personnel and material costs—was also given for six undertakings. In the investigation attention was confined to large cities, since only in these cases could it be expected that the figures would, to any extent, be comparable.

In "distribution costs" were included all costs of technical operation and the maintenance of the system and meters. In addition, there were contributory costs for load distribution, stand-by and breakdown service, staff departments, if available, operation administration and costs due to telecommunication and telecontrol installations. Charges on capital were intentionally excluded, as also were rents, rates and taxes, the cost of power sales and the cost of power losses. The costs of extensions, reinforcement of the installations, as well as cable re-laying in connection with building work in the city, were also neglected.

The most difficult item was to compare the system operating cost in countries with different currencies. The official rates of exchange, and seemingly also the open market rates, were not adequate, because in many countries these are arbitrarily fixed. Since there was yet no satisfactory method of conversion, the report gave no absolute figures of system operating costs; only relative figures were given, and the comparison of cost contributions was limited for the present time to undertakings in the same country.

The distribution costs per kWh (specific costs) exhibited no dependence on the size of the undertaking and therefore no size degression. On the other hand, in each undertaking the specific distribution costs decreased with increasing power sales, i.e. there was a quantity degression. The relative decrease of these costs in most undertakings was smaller than the relative increase of the total power supply. The operating and maintenance costs varied very widely and no mathematical interrelationship could be recognised.

Earthing Protection of Consumers' Installations.—M. Barré[19] (France) presented a report following a general inquiry concerning the methods used in different countries to ensure protection of consumers' installations against metal frames being accidentally made live. There were safety regulations in all the eleven member countries of UNIPEDE from whom information was collected. In many cases they had legal status and in other cases there were official or semi-official regulations which were drawn up by professional associations and which were binding for construction of installations. With few exceptions, checks were made that the regulations were obeyed, either by the distribution undertaking, Government offices, or by officials appointed by them.

The different measures used were protective earthing, multiple-earthed neutral and protective switching. All three types of protection were permissible in Germany, Sweden and Switzerland, although multiple-earthed neutral protection was preferred. In Denmark and Holland multiple-earthed neutral protection was expressly forbidden and in Great Britain its adoption was governed by statutory regulations. On the other hand, in all the countries covered by the inquiry, protective earthing was used. In Belgium, Denmark, Spain, France and Portugal it was practically the only protective measure, resort being made to protective switching only in those cases where the other two methods could not be used economically.

Discharge Lamps in System Operation.—After reviewing the development of the different types of discharge lamps, Dipl.Ing. Obering. E. Stolte[20] (Germany) studied the importance of the lighting load in relation to the total load on the systems of the various countries. In addition to the operating characteristics differing widely from those of incandescent lamps, the report outlined the high reactive power demand associated with discharge lamps due to current-limiting induction coils and magnetic leakage transformers. This impaired voltage stability and increased the system losses in cases where increased usage of these lamps had occurred without compensation having been provided. The different arrangements were studied and their influence on system operation, on acoustic-frequency telecontrol installations, and on the quality of the lighting was made apparent.

The generation of harmonics was a further defect with discharge lamps, since on four-wire circuits the third harmonics were summated algebraically in the neutral and this could give rise to difficulties if the neutral had a smaller cross-section than the phase conductors and if the maximum permissible values were reached. Ballasts had recently been designed to give a very low harmonics component. A study was made of the influence of the harmonics component on voltage stability, losses, acoustic-frequency telecontrol installations and on the life of the lamps. The report ended by making a comparison of the annual costs for different discharge lamps of the same power with those relating to incandescent lamps.

TARIFFS

Amortisation and the Calculation of Production Costs.—The aim of this report by M. Boiteux[21] (France) was to establish clear definitions connected with amortisation and related ideas, and to propose standard methods for the calculation of production costs on which may be founded useful comparisons. The first four sections of the report dealt with industrial amortisation and with other amortisations which might be met with in the undertaking. Then financial charges were considered and the way amortisations were connected with interest charges. As opposed to the foregoing views, which were limited to stable money conditions, the seventh and last section dealt with problems which arose during periods when prices varied.

Comparison of Prices, at International Level, in the Field of Electrical Energy.—M. Tiberghien[22] (Belgium)

gave a paper on this subject. This problem, he said, especially the selling prices of domestic electricity and that of comparison of domestic appliance prices, had been examined and the report had considered certain basic principles and various methods of comparison which might have been suitable.

After analysis of these methods it was concluded that useful indications could be obtained by comparing the costs, in different countries, corresponding to typical supplies, with the proportions of national income devoted to private consumption related to the number of inhabitants. In conclusion, the paper set forth the precautions to be observed in interpreting the results so obtained.

Elasticity of Market Demand for Electricity.—Mr. R. Y. Sanders[23] (Great Britain) pointed out in his report on the above subject that the reaction of consumption to price change was important to tariff policy. After briefly surveying the development of theory on supply and demand it reviewed the factors entering into the analysis of market demand and the difficulties of analysis in the case of electricity, and suggested for discussion possible lines of future research. The report went on to indicate that the subject was one likely to be of increasing importance due to the foreseeable fairly rapid changes in the cost structure of electricity supply due to technical progress, in particular nuclear generation.

DOMESTIC DEVELOPMENT

Development of Domestic Applications from 1953 to 1956.—In the first part of this important report by Messrs. de Felice[24] (France) and Tiberghien (Belgium), a series of national characteristic elements of the development of the domestic uses of electricity were reviewed and commented upon. Data were supplied on numbers of consumers, total consumption, rate of growth of number of appliances, etc., thus completing the statistical data given in the corresponding report of the 1955 Congress.

The second part of the report dealt with some aspects of the relative position of electricity and some other competitive sources of energy, particularly for cooking and water heating. The third and last part of the report dealt with regional studies and gave a brief outline of proposed methods for widening the scope of the previous studies on the subject.

Cost of Domestic Electricity and Appliances.—The previous two authors[25] also contributed a report on the cost of electricity for domestic consumers and the cost of domestic appliances. They first briefly surveyed the development of electricity charges for domestic consumers during the period 1953-56 on the basis of expenditures corresponding to four typical sizes of supplies. A comparison was also made between these expenditures and the part of the national income devoted in the different countries to private consumption.

It was emphasised that the price element was only one of the factors influencing demand and that it was necessary also to take into account other maters, such as the cost of domestic electrical appliances, the cost of competing forms of energy, the extent of commercial activity, etc. Following the same line the latter part of the paper examined the prices, as between one country and another, of a series of domestic appliances having fairly similar characteristics. A similar comparison was made between the national price levels and the proportion of the national income devoted to private consumption.

A further report by these authors[26] gave the results and a commentary on the inquiries that had been carried out by the Domestic Applications Sub-Committee. These inquiries had been made to collect information on recent work by distribution organisations in various countries in respect of the study of the domestic market and of propaganda purposes. A final chapter was devoted to credit sales.

M. de Félice[27] then presented his paper on the relation between the standard of living and the domestic consumption of electrical energy. Here the author showed how inquiries on family budgets could be used to determine the relationship between household income and electricity consumption. The report then proceeded to demonstrate how the results could be utilised to predict the future demand for electricity, as well as the demand for domestic appliances.

Development in the Domestic Field.—M. Tiberghien[28] (Belgium) presented an interesting report on the development of the main applications of electricity in the domestic field. A brief introduction repeated the initial stage of the study as presented in three reports to the 1955 Congress. These dealt with the development of lighting in Italy, electric cooking in Switzerland and electric water heating in Western Germany. The information collected on extending the pilot studies to the international level was the subject of the early chapters of the present paper.

One chapter then dealt with the development of the application of electricity to space heating in Great Britain. This represented a fresh pilot study which would serve as a basis for a more general examination of the problem. In conclusion, a chapter was devoted to the development of the electric refrigerator in some of the countries represented on the Study Committee.

STATISTICS

The first report under the ægis of the Statistics Study Committee was one by Mr. E. T. G. Emery[29] (Great Britain) on the use of regression analysis for setting up standards of performance for steam power stations. In this paper, the author showed that a statistical analysis of operating data could be used to establish a formula which estimated the average results obtained under given conditions. This method took no account of theory or preconceived notions, but simply took the average achievement in the past as the basis for judging operation in the future.

M. K. Holmström[30] (Sweden) described a method of statistical calculation which had been employed for some years by the Swedish State Power Board when they planned the everyday control of power; this supply was based primarily on water power. With the statistical method, it was hoped to give a summary of the power position and a general outline so as to understand how thermal power should be added in order to achieve an economic balance. At the same time the risk of a shortage of power was being investigated.

A contribution by Herr G. Ott[31] (Germany) dealt with the breaking down of the total domestic load into its constituents, using meter-reading methods. The sample sizes for the groups were first estimated and the measuring points established. The collection of the econometric and load data was then described. After dealing with the technical preparation of the material, the logical evaluation and the derivation of the mean for the complete population, the method of multiple regression was described, using as parameters load, living area and family size. In order to illustrate the validity or otherwise of the regression analysis, the representative result was compared with that of the raw sample. In conclusion, the appliance group "lighting/cooking/water heating" was used as an example to show how the correlated results could be summarised in an easily usable form.

Various reports were presented on the subject of the analysis of load curves. One by Mr. P. Schiller[32] (Great

Britain) reviewed briefly the principal methods of load research used by the Electricity Council and the Area Electricity Boards of England and Wales. Recent results were illustrated by graphs and tables, and some details were given of the instruments and procedure used.

Herr O. Herbatschek[33] (Austria) referred to a method of analysis of the load of various groups of consumers, the necessary data (such as meter readings at specified times) being supplied by the consumers themselves. The author described the way in which the inquiry was carried out, the treatment of the collected material and the results obtained.

HYDRO-ELECTRIC GENERATION

[9] The economic conditions in multiple-purpose hydraulic developments, general report by Pierre Delattre (France).

[10] The use of pumped storage for the utilisation of excess energy in the case of the interconnection of hydro-electric stations with important thermal power stations for daily, annual and inter-annual regulation, by Werner Pietzsch (Germany), with the collaboration of Fernando Ivo Goncalves (Portugal).

[11] Determination of the capacity of hydro-electric stations when planning their inclusion with large thermal stations (conventional and nuclear) in the operation of interconnected systems, general report by Fritz Aemmer (Switzerland).

[12] Determination of a quality index for the different forms of hydro-electric energy, general report by Claudio Marcello (Italy).

INTERNATIONAL INTERCONNECTIONS

[13] General report of the Chairman of the Committee, Giorgio Riccio (Italy).

[14] Economic problems in connection with e.h.v. lines, by Francois Cahen and Alexis Dejou (France).

[15] The production and distribution of reactive energy, by Sven Lalander, Harry Gustavsson and Nils Holmin (Sweden).

[16] Some considerations on the degree of safety of high voltage overhead lines against lightning, by G. H. Rietveld, P. G. Provoost and J. J. Suyver (Netherlands).

[17] The establishment of an interconnection between France and Great Britain, by F. J. Lane (Great Britain) and Francois Cahen (France).

DISTRIBUTION

General Report of the Chairman of the Committee, Erich Schulze (Germany).

[18] The operating costs of power distribution networks in large cities, by Erich Schulze (Germany).

[19] Protection of consumers' installations against the metal frames being accidentally made live, by Lucien Barre (France).

[20] Discharge lamps in network operation, by Erwin Stolte.

TARIFFS

[21] Amortisation and the calculation of production costs, by Marcel Boiteux (France).

[22] Methods of comparing prices, at international level, in the field of electrical energy, by Eric Tiberghien (Belgium).

[23] Elasticity of market demand for electricity, by R. Y. Sanders (Great Britain).

DOMESTIC DEVELOPMENT

[24] The development of domestic applications of electricity from 1953 to 1956, by Jacques de Felice (France) and Eric Tiberghien (Belgium), with the collaboration of Louis Puiseux (France).

[25] The cost of electricity for domestic consumers.—The cost of domestic appliances, by Jacques de Felice and Eric Tiberghien, with the collaboration of Louis Puiseux.

[26] Methods used for the study and development of domestic electrical energy consumption, by Jacques de Felice and Eric Tiberghien, with the collaboration of Louis Puiseux.

[27] Relation between the standard of living and the domestic consumption of electrical energy, by Jacques de Felice, with the collaboration of Louis Puiseux.

[28] Development of the main applications of electricity in the domestic field, presented by Eric Tiberghien (Belgium), and established by Alessandro Montagna and Ariberto Tibaldi (Lighting), Josef Blankart and F. Dommann (Cooking), W. Gilchrist (Space Heating), E. Tiberghien (Refrigeration).

STATISTICS

[29] The use of regression analysis for setting up standards of performance for steam power stations, by E. T. G. Emery (Great Britain).

[30] Statistical calculations for planning the control of power, by K. Holmstrom (Sweden).

[31] Statistical elaboration of the necessary data for the study of the load, by Georg Ott (Germany).

Analysis of Load Curves Sub-Committee

[32] Load-research methods used in Great Britain, by P. Schiller (Great Britain).

[33] Method for the analysis of a system load, by O. Herbatschek (Austria).

Letter to the Editor

Letters should bear the writers' names and addresses not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Inadequate Wiring Systems

IN his letter on the above subject Mr. Mackenzie Parkinson certainly hits the nail very squarely on the head. The situation he so accurately describes has been obvious for years to anyone involved in the practical application of domestic appliances, yet when one considers that those concerned professionally (and this means almost everyone in the electrical industry) must also encounter these difficulties in their own domestic lives, it makes one wonder whether or not they really believe in or care about the benefits which electricity *and electricity only* can bring to civilised living.

The stumbling block is, of course, the hide-bound wiring regulations with which we are at present blessed. In 1943, aware of the opportunity which post-war housing would present, I made a plea in these columns for a system of wiring which would enable large numbers of socket outlets to be installed cheaply in new buildings and gave the outlines of a scheme whereby this might be achieved. B.S. 1363, however, has been given to us by the authorities as the answer and it is interesting to see where this has got us.

In the average domestic room there is normally only one position in which a heavy current portable appliance would be used, but there are numerous positions where one would wish to use a light current appliance, yet in the misguided striving for complete interchangeability we have saddled ourselves with a system which demands cables capable of carrying at least 20 A (to make matters worse, mostly looped) and clumsy plug and socket to match at every position from which one desires to use a light, television, vacuum cleaner, etc. The fact is, of course, that interchangeability is only necessary between small appliances and the heavy current items such as fires and washboilers will always be used from positions which can easily be predetermined.

In an attempt to ease the present position I put forward the following suggestion. Let there be one 13 A socket in each room at the heavy current position. Incorporated in this will be a fuse to which could be connected an unlimited number of light-duty sockets in the same room. These latter could be the present 2 A three-pin or a new one specially designed for the job. The cable feeding the sockets need be no bigger than 3/·029in and, despite what the purists may argue, the present 13 A fuse would give adequate protection.

In modern housing with solid floors and thinly-plastered walls the provision of 13 A socket outlets is at present a wasteful and costly business involving as it does 7/·029in cables looped up and down from the floor above with attendant protection and cutting away of walls. How much easier to simply run a small cable horizontally from the one 13 A point necessary to any number of positions the design dictates? In existing property, of course, the benefits would be just as great.

This is a practical approach to a practical problem. What, I wonder, are the objections?

Maidenhead, Berks. B. RAYNOR.

Thermoplastics and the Electrical Industry

By MICHAEL STEWARD, Graduate I.E.E.*

SURVEY OF RECENTLY DESIGNED COMPONENTS

STRONG ties exist between the electrical and plastics industries and many modern developments in electrical plant and equipment have been made possible through the latest techniques in the production of plastic components. From being substitute materials, for many accurate and intricate components, plastics have now become essential for the economical production of many electrical appliances. To quote just one instance: without the use of plastics in the radio and television industry the cost of a television set would still remain beyond the reach of four-fifths of the population.

Completely Automatic Machines

Over the last 10 years the plastics industry has grown at a phenomenal rate and with this expansion new and greatly improved techniques in the manufacture of mouldings have grown up to meet the most exacting requirements and specifications. A development of considerable significance is the introduction of high speed fully automatic injection moulding machines which will work in all thermoplastic materials. These machines are self-contained units, which plasticise, cast, eject, trim, and separate the product from the waste material in one work cycle of 3 to 5 sec. Their capacity limitations are shown in Table I, and it will be noted that with this method of production there is no minimum size. Plastic parts so small that it takes as many as 100,000 of them to weigh a pound are being made already and if anyone wants them even smaller they can be produced.

Normal tolerances held are 0·002in off parting lines and 0·004in on parting lines. Gate vestige (where the part is formed from the runner) appears somewhere along the parting line, a maximum of 0·005in, and it is advisable for designers to allow for this where the tolerance is least important. Closer tolerances than these can be held but, due to the dimensional instability of some thermoplastics, care should be exercised when an application requires such accuracy.

With such small products it might have been expected that multi-cavity moulds which reach the upper limits in the number of cavities would be used. However, the reverse is true and mainly single-impression dies are employed. There are several reasons for this seeming anomaly. Firstly, stress is placed, by the electrical and electronic industries especially, nowadays upon complete uniformity. With a single-impression technique an engineer can be sure that the millionth moulding received will be identical to the first.

TABLE I.—USEFUL DESIGN DATA FOR MINIATURE MOULDINGS

Maximum weight	0·0502 oz
Minimum weight	Unlimited
Maximum length	1¼in
Minimum wall thickness	0·010in
Minimum core diameter	0·015in
Minimum tolerance (off parting lines) ...	0·002in
Minimum tolerance (on parting lines) ...	0·004in

Another benefit is material economy. When small parts are produced in a multi-cavity mould it is not unusual for the waste sprues and runners to outweigh the component in the order of 10:1; therefore, the greater part of the material going through the machine has been reworked several times. This is costly in terms of time, power and labour, and presents problems of material degradation.

It is the purpose of this article to draw attention to the scope which this method of production provides for designers in the electrical industry. Of course, there are many other fields, such as the automotive, chemical, horticultural, textile and food processing industries, where the employment of small thermoplastic parts offers special advantages. In the electrical and electronic industries, however, the additional accuracy and fast production rates achieved are of special importance, and also it is here that the best electrical and mechanical material properties have to be obtained. In these industries, with their exacting requirements in accuracy and intricacies of form, the machines and the new process now available make practicable the manu-

* George Goodman, Ltd.

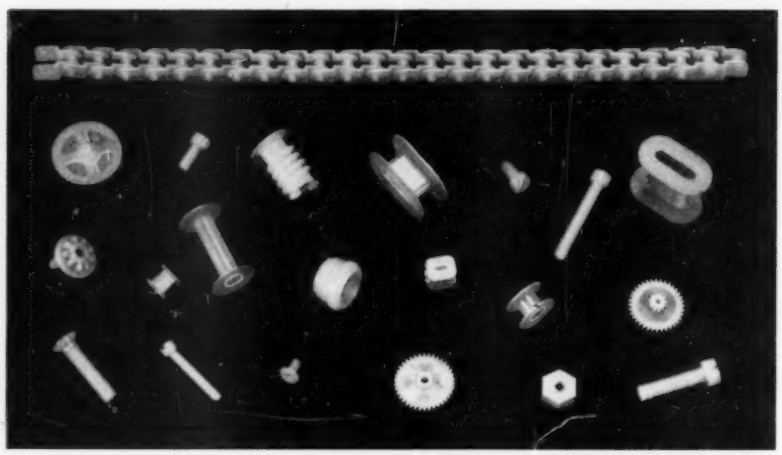


Fig. 1.—Illustrated above are a selection of nylon screws, bobbins and gears. Also shown is a nylon chain produced for a special instrumentation application and selected because of its low inertia, non-magnetic and self-lubricating properties

facture of parts which have hitherto remained outside the scope of the conventional moulding processes. It seems likely, therefore, that this development will enlarge and strengthen the links between the electrical and plastic industries.

These new automatic moulding machines are particularly suited to the production of nylon components and the process enables users to take the fullest advantage of nylon's many outstanding physical properties for electrical component design and manufacture. Nylon is, of course, the name not of a single material, but of a class of synthetic thermoplastics, the polyamides, of which there are several types in commercial production throughout the world. The properties of these polyamides vary according to their type and composition but, in general, nylon polyamides are characterised by their great strength, toughness and resistance to abrasion and most organic solvents. Nylon has a very sharp melting point (about 264 deg C); consequently, any moulding machine has to be designed with care and have injection nozzles of special design.

Fig. 2.—At the bottom left of this selection of nylon and other thermoplastic mouldings are some examples employing the special automatic insert moulding technique

Consideration of some of the products which have already proved the adaptability and success of the machines since their recent introduction to this country, will serve to show the tremendous possibilities inherent in this new process.

Nylon threaded fasteners, a selection of which is shown in Fig. 1, have recently been introduced commercially in this country and the electrical industry has not been slow to see the new design possibilities these open up. Besides having a high strength to weight ratio, being electrically insulating, resistant to corrosion and inert to most chemicals, these threaded fasteners have an added advantage in that their natural resilience allows them to be used in an interference fit. It is thus possible to get a vibration-proof assembly without lock washers.

Coil bobbins made in nylon, also shown in Fig. 1, are being used increasingly in the electrical industry. Being of one-piece construction which cannot come apart, with consequent greater ease of handling and winding, these bobbins have also the advantage over the three-piece fibre or paper assembled coil forms of greater rigidity and higher dielectric strength.

Nylon gears, also shown in Fig. 1, are now being used in timing mechanisms. They are silent running and self-lubricating, and the resistance to abrasion is such that, assuming a nylon and a metal gear were run in train, the nylon gear would outlast the metal one. Again, due to the unconventional moulding process, a one-piece construction of even the most complex gear assembly can be achieved.

In addition, there are a mass of small components in the electrical industry (Fig. 2) which are ideally suited to the new process. Switch components, insulating washers, self-clinching rivets and nuts, terminals and intricate valve and condenser components are all items now being produced in thermoplastics in increasing numbers.

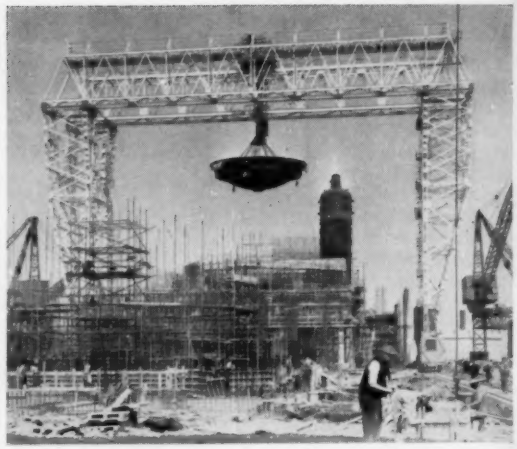
With a new process capable of producing economically large quantities of intricate and very accurate components, considerable scope is afforded to designers. For instance, one advantage offered is the ability to mould automatically, plastic or metal inserts, either as individual inserts or as continuous elements, and a selection of components which incorporate this technique is illustrated in Fig. 2.

Design features are necessarily peculiar to each individual component, but experience has already shown that in considering the use of this new process for moulding thermoplastic parts, the designer usually has to make only minor changes, if any, in the specifications of parts previously produced by more conventional methods. Frequently, small details, which had to be omitted by reason of the limitations of conventional production, can now be re-incorporated and it is frequently the case that the only changes necessary are those to give improvements in appearance or utility.

No attempt has been made in this article to include all the characteristics peculiar to this process, nor has the adaptability of the product been more than touched upon. It will, however, be clear that the multiplication of components, with no limit on smallness and complexity, renders possible the incorporation of such parts into assemblies which have previously been manufactured by far more expensive methods, with consequent saving in material, machining costs, handling charges and subsequent assembly and finishing costs.

The process is new, its full scope has not yet been explored, but there is in the process a potential field of development which may well alter the whole attitude of the electrical industry to the employment of small precision thermoplastic parts and designers may find in it the answer to many problems which have hitherto defied solution.

GENERATION AND DEVELOPMENT



The bottom two courses of one of the reactor pressure vessels being lifted into position at Bradwell nuclear power station. In the background can be seen the heat exchanger which was recently floated down to Bradwell from Thornaby-on-Tees

Six Months' Output

Compensating for the low rate of increase in output in the first half of last year, the figures for the six months of this year to the end of June show a higher-than-average rise. As will be seen from Table 1, a total of 50,328 million kWh was generated during the period by the Central Electricity Generating Board, the North of Scotland Hydro-Electric Board and the South of Scotland Electricity Board, an increase of 11·5 per cent. At the end of the month the total installed capacity was 27,004 MW compared with 26,996 MW in May.

In addition to power sent out for public supply, 5,445 million kWh was generated by industry in the 26 weeks ended 28th June last, an increase of 3·2 per cent.

Sales by the twelve Area Boards in England and Wales are analysed in Table 2. The national figures show an increase over June, 1957, of 12·8 per cent, but, when corrected for weather conditions and working days, the increase is 6·5 per cent.

"Manweb" Progress in 1957-58

The Merseyside and North Wales Electricity Board reports that sales of electricity to all the main classes of consumers continued to expand in the year to 31st March last and totalled 4,749 million kWh, an increase of 319 million kWh. Supplies to industrial users, who took 57 per cent of the aggregate sales in the area, increased by about 8 per cent and supplies to domestic consumers rose by 7 per cent. Of the capital expenditure of £5,871,000, £3,021,000 was spent on the provision of new supplies and £2,431,000 on reinforcing the distribution network. In the last six months of the period under review schemes were sanctioned for providing new supplies to Liverpool docks and to instrument, food and bottle factories at Liverpool, a chemical works at Widnes, a colliery, a packaging material factory and a glass works at St. Helens, railway workshops at Crewe and a hospital at Chester. Further progress has been made in rural electrification. Appliance sales during the year were to the value of £1,861,000, an increase of £350,000 on the previous year.

Electricity at the Royal Welsh Show

At the Royal Welsh Show at Bangor, which closes to-day (Friday), the Merseyside and North Wales Electricity Board, in conjunction with the British Electrical Development Association, has a stand the primary object of which is to bring to visitors' notice the benefits which the use of electricity can bestow on all sections of the community and not least on the farmer and his wife. Emphasis has been placed on automatic control, examples including the automatic control of farm water supplies, grinding of foodstuffs, lighting in poultry houses, drying of harvested crops, milling and crushing of grain, the overnight storage of ice banks to cool the morning milk, etc. Of interest to the housewife is an extensive range of automatically controlled cookers, refrigerators and domestic hot water systems.

Great Yorkshire Show

The electricity stand at the recent Great Yorkshire Show was erected and run jointly by the Yorkshire Elec-

TABLE 1.—ELECTRICITY GENERATED AND SENT OUT OR PUBLIC SUPPLY

	Fuel consumed Thousand tons			kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Coke and Breeze	Oil	Steam	Water power	Total		
Central Electricity G.B. ...	2,904	65	170·1	6,238	8	6,252	5,861	24,585
North of Scotland H.E.B. ...	7	—	1·0	14	107	125	124	930
South of Scotland E.B.	215	8	0·2	405	11	416	392	1,489
Total for June, 1958	3,126	73	171·3	6,657	126	6,793*	6,377	27,004
Corres. total for June, 1957 ...	3,070	61	29·1	5,965	76	6,051	5,668	25,354
Inc. or dec., per cent	+ 1·8	+20·1	+488·0	+11·6	+65·7	+12·3	+12·5	+ 6·5
Total to date (6 months), 1958 ...	24,027	517	860·6	49,145	1,098	50,328	47,361	
Total for corres. 6 months of 1957	22,738	458	160·0	43,967	1,090	45,124	42,418	
Inc. or dec., per cent	+ 5·7	+12·9	+437·9	+11·8	+ 0·7	+11·5	+11·7	

* The total figure includes generation by other methods amounting to 10 million kWh.

TABLE 2.—ELECTRICITY SENT OUT BY AREA BOARDS FOR THEIR CONSUMERS

Area Board	Totals for June (million kWh)			Twelve Months Totals Ended 30th June (million kWh)		
	1957	1958	Inc. or Dec. %	1957	1958	Inc. or Dec. %
London	419·0	465·9	+11·2	6,917·0	7,543·9	+ 9·1
South Eastern	291·0	330·9	+13·7	4,443·0	4,998·4	+12·5
Southern	360·5	425·4	+18·0	5,499·3	6,302·0	+14·6
South Western	193·3	222·1	+14·9	2,777·0	3,065·0	+10·4
Eastern	472·7	535·9	+13·4	7,163·4	7,999·8	+11·7
East Midlands*	423·1	484·0	+14·4	6,118·5	6,677·3	+ 9·1
Midlands*	530·9	612·9	+15·4	7,767·3	8,658·2	+11·5
South Wales*	354·7	386·7	+ 9·0	4,623·8	4,973·6	+ 7·6
Merseyside and N. Wales* ...	353·6	388·6	+ 9·9	4,812·5	5,238·6	+ 8·9
Yorkshire*	563·5	618·7	+ 9·8	7,981·3	8,631·6	+ 8·1
North Eastern*	330·9	363·6	+ 9·9	4,613·7	5,033·7	+ 9·1
North Western*	584·3	635·7	+ 8·8	8,277·2	8,898·5	+ 7·5
Total all Area Boards	4,877·5	5,470·4	+12·2	70,994·0	78,020·6	+ 9·9
Direct Supplies by C.E.G.B. ...	182·8	236·5	+29·4	2,261·7	2,739·4	+21·1
Grand Total	5,060·3	5,706·9	+12·8	73,255·7	80,760·0	+10·2
Mainly Industrial Areas*	3,141·0	3,490·2	+11·1	44,194·3	48,111·5	+ 8·9
Mainly Non-Industrial Areas ...	1,736·5	1,980·2	+14·0	26,799·7	29,909·1	+11·6

* Those in which industrial consumers took over 50 per cent of the total sales in the preceding financial year.

tricity Board and the North Eastern Electricity Board. Equipment displayed included barn machines, especially milling and mixing machines, grain-handling equipment and a small-scale dual purpose grain- and grass-drying plant. There was also electrical equipment for milk production, pig and poultry farming and for the market and amateur gardener. In the domestic section there were continuous demonstrations of home-laundering and cooking.

OVERSEAS

Indian Five Year Plan

In a memorandum on India's Second Five Year Plan, the Planning Commission says that for completing an outlay of Rs. 4,800 crores, the balance of resources required in the last two years is Rs. 2,344 crores. This is no easy task especially as deficit financing in the first two years has been heavy. On the basis of the first three years' trends and taking into account some improvement in receipts under loans and small savings, the resources available for the last two years of the Plan are placed at Rs. 1,804 crores. The gap has to be covered, to the extent possible, by a further effort to raise resources through taxes, loans and small savings and through economies in non-Plan expenditure.

Dealing with power projects, the memorandum states that the total installed capacity during the Plan period is expected to be nearly 3,000 MW as against the original target of 3,500 MW.

Development in Mauritius

A five-year £15¾ million development programme has been published by the Government of Mauritius. It includes the strengthening of the basic network of communications and power supplies so as to provide for greater economic activity.

Supply to Tanganyika Mine

Power from the Uganda Electricity Board's hydro-electric station at Kikagati is now supplying a consumer in Tanganyika. A 33 kV line has been erected by the Kyerwa Syndicate, Ltd., across the Kagera River and through bush and hill country to their tin mine over thirty miles across the border. Since there is no telephone system in this area, a radio link will be maintained between the mine and the power station. Supply to the mine is an important part of the Uganda Board's plan for development in the district. Good progress has also been made on the construction of the transmission line from Kikagati to Mbarara and it is expected that power will be available in Mbarara in a few weeks' time.

In the first six months of this year 132 million kWh was generated by the Uganda Board, compared with 70·2 million kWh in the same period of last year, an increase of 88·2 per cent. Excluding the 40·9 million kWh exported to Kenya, the increase was 29·9 per cent. The end of June completed the first six months of the bulk supply to Kenya. During this period the supply from Uganda was maintained continuously except for one interruption of five minutes on 6th April during a heavy storm.

New Israeli Power Station

Israel's latest and largest generating station has been built at Ashdod, reports Barclays Bank D.C.O. At present one 50 MW turbo-generator has been installed, but by the end of the year three sets are expected to be in operation.

Increased Demand in Cyprus

The sixth annual report of the Electricity Authority of Cyprus, which was briefly referred to in our last issue, shows that the supply system was again expanded in 1957 to meet the continued heavy demand for electricity in all districts. There were extensive additions to the h.v. and l.v. mains for new industrial, commercial, village and suburban consumers, as well as for irrigation purposes, and considerable reinforcement and reconstruction work was also carried out. Twice as many consumers were connected as in any previous year. Use of electricity by domestic consumers increased by 64 per cent and by commercial and industrial consumers 44 per cent. Total sales were 122 million kWh, an increase of 46 per cent, and at the end of the year consumers numbered 58,077—10,990 more than a year before. As a measure of the progress of domestic development, it is shown that in the Nicosia district 452 cookers and 529 water heaters were connected last year, compared with 164 and 346, respectively, in 1956.

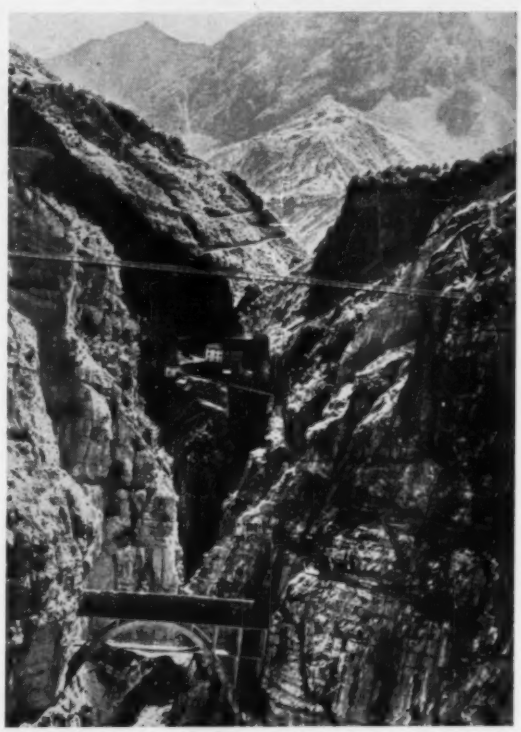
Revenue amounted to £1,451,051 (against £1,014,476) and there was a gross surplus of £462,194 (£366,251). After charging £329,564 interest on loans and £172,219 depreciation, a balance of £150,661 remained, to which has been added £56,042 brought forward. A sum of £150,000 has been set aside as a reserve for development. Capital expenditure last year amounted to £1,248,871. As from 1st January, 1958, the Authority was able to announce reductions in certain commercial and industrial tariffs.

Dealing with future development, the Authority states that a further review in the early part of 1957 indicated that the plans on which the Authority's financial requirements were estimated were likely to be inadequate. It was also clear that the first part of a new power station should be in operation not later than the winter of 1960 to enable the Authority to afford uninterrupted supplies, with the usual margin of spare plant for maintenance and repairs. Additional 132 kV overhead power lines would be necessary. Unfortunately the capital resources already allocated to electrical development cannot be increased and the Authority has therefore been precluded from placing contracts for these projects, and a drastic curtailment of the development programme is inescapable. The Authority is proceeding with the detailed planning of a new station so that no time will be lost if the financial situation eases.

High Italian Dam

The accompanying picture shows the difficult nature of the terrain in which the Vajont Dam is being constructed in Northern Italy. The dam has been designed by the Società Adriatica di Elettricità and the construction is being carried out by Ing. G. Torno & Cia., Milan. It connects the Piave-Ansiei scheme in the north with the Piave-S. Croce scheme to the south. The dam is 872ft high and 626ft wide at the top and the thickness runs from 76ft at the base to 10ft at the top.

The Vajont Dam (Italy) under construction



Financial Section

STOCKS and SHARES

AS a consequence of the Middle East crisis, the inevitable marking down of quotations took place in the Stock Exchange, and prices have been left to fluctuate with changes in the tenor of the news. The volume of business has, however, shrunk to small dimensions, and if buyers have for the present largely withdrawn from the scene, there has been almost equally little evidence of any large-scale selling of securities. Gilt-edged stocks suffered a fairly severe relapse, War Loan losing the best part of 2 points in the first week of the crisis; but, outside the oil market, many ordinary shares maintained their value reasonably well in that period, as can be judged by the moderation of the changes marked this week in the electrical share lists.

G.E.C. Dividend

The price of the General Electric Company's £1 shares showed little initial alteration, at around 32s 6d, after the publication of the results for the year ended in March and the declaration of the final dividend, which brings the total to 10 per cent, or 2½ per cent less than last year's. The extent of the decline in earnings disclosed in the preliminary statement is much in line with market expectations held since the time of the board's decision in January to reduce the interim payment. Shareholders were advised then of the likelihood of a marked recession as a result of the continued pressure on profit margins. Clearly the latter was the main factor in the 22 per cent drop in trading profits to £4¾ million (before tax), for sales are stated to have risen during the period by more than 6 per cent, to £104½ million. Net earnings cover nearly 1½ times the amount of the ordinary dividend, which gives a yield of just under 6½ per cent on the shares. The full report, with the chairman's comments on the results and the outlook, was due to be in shareholders' hands this (Friday) morning.

Scottish Cables Issue

The 4s shares of Scottish Cables have been conspicuously well supported recently up to 16s. Trading profits of the company were more than maintained during 1957–58, despite narrower margins of profit. With a net surplus of £183,000, the company is able comfortably to distribute again the 27½ per cent rate of dividend paid in the four previous years, and £100,000 has been added to the general reserves. This brings total revenue reserves to over a million, and at the company's twenty-first annual meeting the chairman announced the intention of capitalising £417,000 in making a scrip issue of five new 4s shares for every seven held, raising the issued ordinary capital to £1 million. A good start had been made to the current year, and the chairman looked forward to further satisfactory results in normal circumstances.

Ward & Goldstone Results

Announcement of Ward & Goldstone's annual results coincided with

Price Changes in

Company or Board	Nom. Value	Middle price 21st July	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1958 Highest	1958 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	75	−½	3	3	4 0 0	76	72
Brit. Elec. 1974/77	100	72½	−½	3	3	4 2 9	73½	68½
Brit. Elec. 1976/79	100	76½	−½	3½	3½	4 11 6	77½	72
Brit. Elec. 1974/79	100	86½	−½	4½	4½	4 18 3	87	82½
Overseas Electric Supply								
Calcutta Elec.	£1	16/-		6†	6·8†	8 10 0†	16/9	15/-
East African Power	£1	18/6		7	7½	8 2 3	19/-	17/6
Nigerian Elec.	£1	13 9	−1 3	10	10	14 11 0	17 -	13/9
Perak Hydro-Elec.	£1	13/6	−6d	10	12½	18 10 6	15/6	13/6
Electrical Shares								
Aberdare Holdings	5/-	12/-		17½	17½	7 5 9	12/-	9/9
Aerialite	1/-	6/9	−3d	48	51½	7 12 6	7/-	5/1
Allen, W. H.	£1	37/3x.d.	+1/-	10	11	5 18 0	37/3	32/9
Anglo-Portuguese Tel.	£1	24/9		8	9	7 5 6	27/3	19/9
Aron Elec. Ord.	£1	55/-		15	15	5 9 0	57/6	53/-
Assoc. Elec. Ord.	£1	50/-		15	15	6 0 0	51/3	46/6
Automatic Tel. & El.	£1	65/-		17	17	5 4 6	66/3	57/-
Babcock & Wilcox	£1	47/9		15	13‡	5 8 9	52/9	41/9
Bakelite	10/-	18/9	−6d	15	15	8 0 0	21/-	17/6
Baldwin, H. J.	2/-	2/6		20	20	16 0 0	3/9	2/6
Barry's Electric	5/-	6/-x.d.		10	10	8 6 9	7/6	5/9
British Aluminium	£1	46/3	+1/3	12	12	5 3 9	47/-	37/-
Brit. Elec. Traction: Def. Ord. "A"	5/-	24/6		25	25	5 2 0	24/6	19/6
B.I. Callender's	£1	41/6	−1/6	12½	12½	6 0 6	45/6	38/9
B.I. Callender's 6% Pref. ...	£1	19/-		6	6	6 6 3	20/3	19/-
British Tabulating	£1	49/-	−1/-	9	10	4 1 9	51/3	38/6
British Thermostat	5/-	29/3	−9d	25	30	5 2 6	30/-	19/9
British Vac. Cleaner	5/-	5/3	+6d	10	10	9 10 6	5/3	4/6
Brook Motors	10/-	37/6		25	25	6 13 3	37/6	33/3
Bulgin, A. F.	1/-	5/3		40	45	8 11 6	5/6	4/7
Bulpitts	5/-	7/3	−3d	—	12½‡	8 12 6	7/6	7/3
Burco Dean	5/-	8/3	−3d	20	22½	9 1 9*	9/6	7/9
Cable & Wireless: Ord.	5/-	10/6		10	10‡*	4 15 3	10/6	8/-
4% Loan	100	93½		4	4	4 5 6	94½	89
Chloride El. Storage "A" ...	£1	57/-	−6d	17½	17½	6 2 9	62/-	55/6
Clarke Chapman	£1	25/-	+2/6	27½	27½	4 8 0	7½	5½
Cole, E. K....	5/-	15/3	−3d	17½	17½	5 14 9	18/-	15/6
Cossor, A. C.	5/-	4/6		Nil	2½	2 15 6	5/6	4/4
Crabtree	10/-	28/-		20	20	7 2 9	28/-	24/4
Crompton Parkinson Ord. ...	5/-	10/3		16	16	5 4 0*	10/6	8/3
De La Rue	10/-	23/3	−6d	35	17½*	7 10 6	26/3	20/9
Decca "A"	4/-	25/6	−3d	43½	43½	6 17 3	27/6	21/3
Desoutter	5/-	16/6		32½	18½*	5 13 9	16/6	13/6
Dewhurst	2/-	7/6		16½	20	5 6 9	8/-	6/9
Dictograph Tel.	2/-	6/3		20	20*	6 8 0	6/3	4/7
Dubilier Condenser	1/-	3/6x.d.		30	20*	5 14 3	4/3	3/1
Duport	5/-	8/-	−3d	25	25	7 16 3*	9/4	7/9
E.M.I.	10/-	35/3	−9d	15	15	4 5 0	36/9	27/6
Electrical Components	5/-	7/6		25	12½*	8 6 9	8/-	7/-
Elec. Construction	£1	23/9		8½	8½	7 3 3	25/-	21/-
Elliott-Automation	5/-	14/6		—	10‡	3 9 0	14/6	11/6
Enfield Cable Ord.	£1	13/6	−6d	Nil	2½	3 14 0	17/-	10/9
English Electric	£1	53/3		14	14	5 5 3	56/3	44/-
English Electric 3½% Pref. ...	£1	12/-		3½	3½	6 5 0	12/3	11/9
Ericsson Tel.	5/-	19/9	−6d	22†	12*†	3 0 9†	21/-	17/6
Ever Ready	5/-	18/-		37½	20*	5 11 0	19/3	13/9
Falk Stadelmann	£1	36/3	−2/6	17½	17½	9 13 0	38/9	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

very unsettled market conditions, and although increases were notified in both profits and the dividend the 5s shares have subsequently been quoted lower at 26s 6d ex-dividend. The dividend of 25 per cent goes to capital doubled by a scrip issue and represents in effect an advance of 5 per cent on last year's. With the net profit up by £8,000 to £448,000, the payment remains in the highly conservative class: from the preliminary figures it appears to leave well over three-quarters of the surplus to go back into the business. This is the eighth year running in which shareholders will have received a larger return on their investment.

Electrical Investments

Company or Board	Nom. Value	Middle price 21st July	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1958 Highest	1958 Lowest
Electrical Shares—continued						£ s d		
G.E.C. Ord.	£1	32/6		12½	10	6 3 0	38/9	29/3
G.E.C. 6½% Pref.	£1	20/3		6½	6½	6 8 6	21/3	20/3
General Cables	5/-	10/3		30	24	—	11/9	10/3
Greenwood & Batley	£1	48/3		17½	20	8 5 9	48/3	45/-
Hackbridge Holdings	5/-	13/3		30	20	7 11 0	14/3	7/6
Hackbridge & Hewittic	5/-	11/-x.d.		20	20	9 1 9	12/-	9/7
Head Wrightson	5/-	20/3x.d.		22½	17½*	4 6 6	22/3	16/9
Heatrae	2/-	6/-		15	20	6 13 3	6/-	4/-
Henley's	10/-	11/-	−6d	11½	11½	10 9 0	14/6	10/6
Holophane	5/-	13/3	−3d	30	37½	8 10 0*	13/9	12/6
Hoover	5/-	42/6		50	50	5 17 9	43/-	31/-
I.C.I.	£1	29/-	+1/-	10	12	5 10 3*	30/3	23/9
Intl. Combustion	5/-	26/6		22½	25	4 14 3	26/6	19/3
Johnson & Phillips	£1	16/3	−1/3	10	5	6 3 0	25/-	15/-
Lancashire Dynamo	£1	40/-		11	11	5 10 0	40/-	28/6
Laurence Scott	5/-	14/9		15	15	5 1 9	14/9	12/6
Lister, R. A.	£1	24/6		10	10	8 3 3	26/3	23/-
London Elec. Wire	£1	44/6	−6d	12½	12½	5 12 3	45/-	39/6
Lucas, J.	£1	36/9	−9d	7½	7½	4 1 9	37/6	27/9
Marconi Marine	£1	32/-	−6d	10	10	6 5 0	32/6	29/-
Marryat & Scott	2/-	13/3x.d.		35	37½	5 13 3	14/-	10/3
Mather & Platt	£1	38/9	−9d	15	15	5 3 3*	40/-	29/6
Metal Industries	£1	33/6		9	14	8 7 3	33/6	22/9
Midland Elec. Mfg.	£1	46/3		12½	12½	5 8 0	48/3	44/-
Morphy-Richards	4/-	16/-		50	20*	5 0 0	16/9	14/6
Murex	£1	50/6	−5/-	20	17½	6 18 6	58/3	49/3
Newman Ind.	2/-	2/3		10	10	8 17 9	2/9	2/3
Oldham & Son	1/-	2/6		17½	17½	7 0 0	2/7	2/3
Parnall (Yate)	5/-	15/-		12	12	4 0 0	15/-	5/9
Parsons, C. A.	£1	46/3	−3d	8½	7½*	3 4 9	53/6	43/-
Plessey	10/-	57/6		30	30	5 4 3	60/6	55/-
Pye "A" Deferred	5/-	11/3	−6d	12½	12½	5 11 0	13/9	10/-
Reyrolle	£1	76/3		17½	17½	4 11 9	84/6	73/6
Rheostatic	4/-	6/-		12½	12½	8 6 9	8/-	6/-
Richardsons Westgarth	10/-	13/6		16½	8½*	6 3 6	15/-	13/-
Scottish Cables	4/-	16/-	+9d	27½	27½	6 17 6	16/-	12/3
Simon-Carves	5/-	26/3	−6d	20	25	4 15 3	27/9	22/6
Smith (England), S.	4/-	9/3		17½	20	4 6 6*	9/3	7/-
Southern Areas	£1	10/3		7½	Nil	Nil	13/9	9/3
Strand Elec.	5/-	4/9	−6d	15	15	15 15 9	6/3	4/9
Sturtevant	5/-	14/9	−6d	15†	15†	5 1 9†	18/-	14/9
Sun Elec.	£1	50/-	+2/6	25	25	10 0 0	50/-	47/3
Switchgear & Cowans	5/-	11/9		25	22½	9 11 6	11/9	8/9
Taylor Tunnicliff	5/-	13/3		15	17½	6 12 0	13/9	11/9
T.C.C.	10/-	35/-		25	25	7 2 9	38/6	35/-
T.C. & M.	£1	23/-	−1/-	8½	8½‡	7 7 9	27/-	20/-
Telephone Mfg.	5/-	4/9		10	10	10 10 6	5/3	4/6
Telephone Rentals	5/-	11/6		12½	12½	5 8 9	11/6	9/9
Thompson (John)	5/-	24/-		25	25	5 4 3	27/-	23/-
Thorn Elec. "A"	5/-	21/3	+6d	15	17½	4 2 3	23/3	17/-
Thornycroft	£1	21/3		12½	12½	11 15 3	27/9	21/-
Tube Investments	£1	55/-	−6d	13½	15	5 9 0	55/6	48/3
Vactric	5/-	15/-		25	25	8 6 9	15/6	14/3
Veritys	5/-	5/3		12½	2½	2 7 6	6/9	5/3
Walsall Conduits	4/-	14/3		20	22½	6 6 3	14/3	11/-
Ward & Goldstone	5/-	26/6x.d.	−2/-	40	25*	4 14 3	29/-	23/6
Watford	2/-	6/6		25	25	6 3 0*	7/6	5/-
Westinghouse	£1	38/6		18	10*	5 4 0	40/-	32/3
West, Allen	5/-	11/6		15	12½*	5 8 9	12/-	9/3
Wolf Electric	5/-	7/3		20	10*	6 18 0	9/-	6/9

James Scott Report

Following the publication of the full report, the 5s shares of James Scott & Co. (Electrical Engineers) maintained most of the rise in price, to about 1s, which had taken place earlier on the preliminary announcement of the results for last year, and of an increase in the dividend from 20 to 22 per cent. According to the chairman's statement the improvement in the net taxed profit to £97,000 was the outcome of a record turnover, which exceeded the previous year's by about 15 per cent. Not much more than one-third of the distributable surplus goes out in the dividend. With orders on hand still at a high level, and to deal with increasing business, the board is taking steps to enlarge the borrowing powers: proposals will be made to shareholders following the annual meeting on 5th August. On the new rate of dividend, the yield on the shares is 7¼ per cent.

Dividends Declared

Venner 5s shares were quoted at 11s 6d after the company's preliminary announcement of a trading profit of £80,000 for 1957, and a seventh successive dividend of 15 per cent, on the basis of which the yield works out at 6½ per cent. In comparison with the previous year, the profit is up by £16,000, but the increase is rather more than offset by a heavier tax provision, leaving a balance of £33,000. The company's interest in parking meters is a consideration affecting these shares. Parmiter Hope and Sugden are also paying the same rate of dividend, in this case 30 per cent, as for some years previously, and report a net profit of £32,000, which is almost level with the figure for the year before. There is a return of nearly 11½ per cent on the 1s shares at 2s 7½d. Murex £1 shares fell to below 50s after the decision to lower the dividend from 20 to 17½ per cent.

Hackbridge & Hewittic

In his review accompanying the full report of Hackbridge & Hewittic for the year ended last March, Mr. A. M. Browne attributed the expansion of earnings during that period to previous work on improvements in the factory: larger and more efficient production offset the contraction of profit margins. Of prospects in the current year, the chairman reported that orders for large equipment ensured full employment for the sections concerned. Profits for 1957–58, at £165,000 after tax, represent earnings of 36 per cent gross on the £750,000 ordinary capital, and thus cover nearly twice over the 20 per cent rate of dividend. In the latest balance sheet the overdraft has disappeared and the cash holdings are larger than previously. At about 11s the 5s shares offer a yield of 9 per cent.

REPORTS and DIVIDENDS

The General Electric Co., Ltd.—Although sales for the year to 31st March last amounted to £104·4 million, an increase of 6·1 per cent as compared with the previous year, the group profit fell from £6,168,170 in 1956-57 to £4,765,143 last year. In a preliminary statement the directors report that, as indicated by the board last January, when the interim dividend was reduced by 1 per cent, the profits show a marked decline owing to pressure on profit margins. After providing for United Kingdom taxation of £2,593,981 (against £3,245,076), the net profit attributable to the holding company is £1,605,480 (against £2,397,336). In addition £60,698 net profit relating to previous years has been brought into the group account. It is proposed to pay a final ordinary dividend of 6½ per cent (against 8 per cent), making 10 per cent (12½ per cent) for the year.

Ruston & Hornsby, Ltd.—In his review for the year ended 31st March last, Mr. W. J. Ruston (chairman) says the net earnings of the group are down on the previous year, but in part this is accounted for by a further reduction in income from trade investments. Apart from general trading difficulties, they have had to meet a further rise in costs following the wage increase in the engineering industry. There has been an overall increase in the output of the group, but the uneven spread of this increase referred to last year has repeated itself in the year under review. The main effect has been felt in the smaller sizes of engines where the situation has been aggravated by the continuance of the credit squeeze. Apart from marine equipment, exports have expanded to Australia, Argentina, Canada, Iran, Siam and certain European countries. Although there has been some resumption of business with Saudi-Arabia and Egypt, this has been on a relatively modest scale compared with what was obtained in 1956 and earlier.

Further new models of diesel engines have been introduced and others, both air-cooled and water-cooled, will be launched during the current year. Considerable development continues in the range of diesel locomotives; new models have been placed upon the market and further new designs will be completed during the current year. Sales of their standard Mark TA gas turbine continue to expand. During the year a new range, the Mark TE, of 430 h.p., was launched, and work is in progress on two further designs of turbines. Their boiler works and fabricating shops are fully occupied and 95 per cent of their boilers are now produced to an all-welded design.

Development in the nuclear energy field continues, but the marketing by the company of a medium-sized nuclear power plant is dependent upon the introduction of a suitable reactor which is not likely to become available for some few years.

After briefly reviewing the activities of the subsidiaries and associates, Mr. Ruston refers to prospects and says that the unexecuted order book at the end of the financial year was 14 per cent less in value than at the end of the previous year. While during more recent months the rate of orders has improved, the pattern of these is unbalanced, resulting in certain sections of the factories working well below capacity.

James Scott & Co. (Electrical Engineers), Ltd.—The main figures in the accounts for the year ended 31st January last were given in our issue of 11th July. In his circulated statement, Mr. I. Sclar (chairman and joint managing director) says that the turnover for the year was again a record figure, with an approximate increase of 15 per cent, but overhead costs have again risen and profit margins have decreased. Malcolm & Allan, Ltd., electrical and motor engineers, which was taken over in February last year, and had previously been showing losses, has in the year under review contributed a small profit.

Their electronics section has expanded and present and future developments have necessitated the leasing of a factory from Scottish Industrial Estates, Ltd., in Carntyne. They have recently acquired the business of Porter's, Edinburgh, which they intend to develop as an additional electrical contracting centre. In order to co-ordinate their purchasing, and improve the handling of some of their manufactured products, they have recently registered the Clyde Engineering & Equipment Co., Ltd., with a nominal capital of £50,000. The Transmission Department again completed several hundred miles of h.v. and l.v. overhead lines in Scotland and the North of England. Contracts for the United Kingdom Atomic Energy Authority at Chapelcross, Springfields and Dounreay were continued at a high rate and extensions to some of these contracts have been allocated during the year. They have recently been awarded a cabling contract for Kincardine power station. Orders in hand at the beginning of the current financial year were again at a high level.

Murex, Ltd.—The group profit declined from £1,021,000 for 1956-57 to £983,000 for the year to 30th April last, and the net profit is lower by £61,000 at £291,000, after taxation of £432,000. It is proposed to pay a final dividend of 10 per cent (against 12½ per cent), making 17½ per cent for the year (20 per cent for 1956-57). The balance carried forward is £137,000 (against £123,000 brought in). The directors state that the fall during the year in the world prices of certain essential raw materials resulted in further substantial stock losses. The overall demand for the metallurgical products of the parent company suffered a sharp decline in the period January to April last; this was accentuated by customers' stock reductions. The trading profits of the last four months of the year were substantially below those of the preceding eight months, which had been maintained at the level of the previous year.

Sales of welding products by Murex Welding Processes showed a satisfactory increase over 1956-57. As improved deliveries of British rolled steel rod became available, imports were proportionately reduced and have now ceased.

Expenditure during the year on capital projects was again at a high level; it was decided, however, to defer certain items included in the capital programme and so conserve cash resources. Modifications to the proposals for raising additional capital outlined in the interim dividend announcement in December last are under consideration and the matter will be dealt with more fully in the forthcoming directors' report.

The Engineering & Lighting Equipment Co., Ltd.—The annual meeting was held on 14th July, the Earl of Verulam (chairman) presiding. In his statement, which had been previously circulated, the chairman said that they had had another busy year, but despite increased turnover, the net profit was less than for the previous year. Turnover increased by 19 per cent, but the net profit fell from £41,065 to £27,700. The success of the subsidiary, St. Albans Diecasters, Ltd., which manufactured light alloy castings, had been such that substantial quantities of raw materials had had to be bought over the year. This they regarded as inevitable, even though embarrassing at a time when metal prices had tended to fall. An embarrassment in the opposite direction, but with similar unfortunate effect, had been the general wage increase which took place in May last year; their order book was heavy at the time, but they decided that it was in the best interests of the business to accept this increase themselves and not try to pass it on to customers whose contracts were already signed.

George Cohen 600 Group, Ltd.—The financial results for the year ended 31st March last show group profits of £1,813,815, as compared with £2,336,628 for 1956-57, and after meeting £996,638 for taxation, the net profit is £817,177 (against £1,097,686), of which £808,179 is attributable to the holding company. To this are added provisions of £100,501 no longer required. It is proposed to pay a final dividend of 7½ per cent, making 12 per cent for the year on capital of £3,125,000. The total of 12 per cent in the previous year included an

interim dividend of 3½ per cent on capital of £2,500,000 before a one-for-four "rights" issue. A sum of £175,004 is placed to the general reserve of subsidiary companies and the balance carried forward is £357,923 (against £524,374 brought in).

Ward & Goldstone, Ltd., report a group net profit for the year to 31st March last, after deducting taxation of £435,753, of £447,934, as compared with £440,210 for the previous year. It is proposed to pay a final dividend of 17½ per cent, making 25 per cent on the combined ordinary and "A" ordinary capital. For the previous year the total distribution was 40 per cent, paid on capital before a one-for-one scrip issue.

The Ebonite Container Co., Ltd., reports that after providing £104,980 for taxation, the group net profit for the year to 31st March last is £94,113, as compared with £69,356 for the previous year. It is proposed to pay a final dividend of 15 per cent, making 25 per cent for the year (against 22½ per cent), and in addition it is proposed to make a one-for-five free scrip issue.

The directors state that as a matter of internal organisation only, the Ebonite manufacturing activities of the group will in future be conducted by a wholly-owned subsidiary company which has been incorporated under the name of Ebonite Container Co. (Manufacturing), Ltd.

Radio Rentals, Ltd., proposes to make a one-for-one scrip issue of 4 million 5s ordinary shares to ordinary shareholders. The £1,000,000 to be capitalised will be taken as to £400,000 from share premium account, as increased by the acquisition of the ordinary capital of Hyman Lazarus Cabinets, and as to £600,000 from general reserve. It is stated that the issue should not be taken to indicate an increase in the total sum to be distributed for the year to 31st August next. An extraordinary meeting to create 6 million 5s ordinary shares and to effect the issue will be held on 13th August.

Pinchin Johnson & Associates, Ltd.—After meeting all charges, including £1,061,647 for United Kingdom and overseas taxation, the net profit for the year to 31st March last was £748,827 (against £744,452 for 1956-57). Reserves receive £136,722 and it is proposed to pay a final dividend of 11¼ per cent, making 16⅔ per cent (unchanged) for the year. The balance carried forward is £1,196,862 (against £1,146,173 brought in).

The Nigerian Electricity Supply Corporation, Ltd.—The accounts for the year to 28th February last show a profit, before taxation provision of £70,881, of £168,643, as compared with £144,512 for 1956-57. To this is added £9,037 taxation over-provision of previous years, and after placing £30,000 to general reserve and £40,000 to dividend equalisation reserve, it is proposed to pay a final dividend of 4 per cent, making 8 per cent for the year (against 10 per cent).

Venner, Ltd., reports a profit for 1957 of £80,372, as compared with £64,158 for 1956, and after providing £47,591 for taxation, the net balance is £32,781 (against £35,761). General reserve receives £15,000 and the dividend for the year is maintained at 15 per cent. The balance carried forward is £16,472 (against £18,701 brought in).

Oldham & Son, Ltd.—Group profits for the year ended 31st March last were £411,592, as compared with £452,697 for the preceding year. Taxation requires £174,661, leaving a net profit of £236,931 (against £266,067). The dividend for the year is maintained at 17½ per cent by a final payment of 10 per cent, and general reserve receives £72,537.

Parmiter, Hope & Sugden, Ltd.—The group net profit for the year ended 31st March last is £31,899, as compared with £33,583 for the preceding year. Taxation charged is £46,303. The ordinary dividend for the year is maintained at 30 per cent by a final payment of 22½ per cent.

R. B. Pullin & Co., Ltd., are paying an interim dividend of 5 per cent (unchanged).

Cable & Wireless (Holding), Ltd., is paying a second quarterly dividend of 2½ per cent on the £7,865,000 capital. The previous quarterly dividend of 2½ per cent was paid on the £6,655,000 capital.

The Sun Electrical Co., Ltd., is paying an interim dividend of 5 per cent (unchanged).

New Companies

Bonham Electrical Co., Ltd.—Registered 5th June. Capital £15,000. Electrical engineers, general electrical and refrigeration installations contractors, manufacturers of and dealers in radio and television sets, etc. Directors: J. Sharp and D. G. Dobson. Regd. office: Sibthorpe Street, North Shields, Northumberland.

G. V. Gray, Ltd.—Registered 5th June Capital £100. Electricians, radio, television, telephonic and telegraphic engineers, etc. Directors: A. Weaver and G. V. Gray. Regd. office: 196 (Unit 8), Bristnall Hall Road, Warley, Oldbury.

E. H. Hornsby (Electrical Engineers), Ltd.—Registered 5th June. Capital £3,000. Directors: E. H. Hornsby, Florence M. Hornsby and G. D. Hornsby. Regd. office: 13/15, Melbourne Grove, East Dulwich, S.E.22.

L. Elderfield, Ltd.—Registered 5th June. Capital £5,000. Electrical contractors and engineers, manufacturers of and dealers in dynamos, motors, armatures, etc. Directors: L. N. Elderfield, K. Elderfield and J. F. Collins. Regd. office: The Broadway, Farnham Common, Bucks.

Robert Ritchie (Electrical), Ltd.—Registered 5th June. Capital £100. Manufacturers and repairers of and dealers in electronic and electrical instruments, plant, machinery, fittings and accessories, etc. Directors: R. Ritchie and G. Wilson. Regd. office: Derby Street, Colne, Lancs.

E. Mills & Co. (Electrical), Ltd.—Registered 6th June. Capital £500. Manufacturers of and dealers in television and radio receivers and transmitters, etc. Directors: E. B. Mills and E. J. Mills. Regd. office: "Craigmill," 16, Crossways, Shenfield, Essex.

Southern Electrical Repairs, Ltd.—Registered 9th July. Capital £5,000. Electrical equipment specialists, etc. Directors: A. H. Sockett and Mrs. Doris E. Sockett. Regd. office: 55, Millbrook Road, Southampton.

A. McNaughton, Ltd.—Registered 9th July. Capital £5,000. Electrical engineers and electrical installation contractors, etc. Directors: A. J. H. McNaughton and Mrs. Joan McNaughton. Regd. office: 42, Gordon Road, West Bridgford, Nottingham.

Cheltronics, Ltd.—Registered 9th July. Capital £3,000. Designers, manufacturers, auctioneers, assessors, importers, exporters, agents for and dealers in electrical, electronic and mechanical devices, transformers of all kinds, motors, dynamos, etc. Directors: H. G. Barnett and A. L. Copp. Regd. office: Tryes Road, Cheltenham.

Kendall's (Caterham), Ltd.—Registered 9th July. Capital £5,000. Manufacturers of and dealers in electrical goods of all kinds, etc. Regd. office: 7, Croydon Road, Caterham, Surrey.

Electronics Radio Service, Ltd.—Registered 4th July. Capital £100. Radio, television, electrical and electronic engineers, etc. Directors: S. Blyton and W. Crisp. Regd. office: 16, Brixton Road, S.W.9.

Bankruptcies

G. F. Hedger, trading at 80, Grenville Road, Plymouth, under the style of Hedger & Greenway, electrical contractor, formerly carrying on business in partnership with another at that address.—Receiving order made 7th July on debtor's own petition.

T. R. Dillon, lately carrying on business with two others under the style of Hainault Electrics, at 19, Brunner Road, Walthamstow, London, E.17.—Public examination 9th September at Bankruptcy Buildings, Carey Street, London, W.C.2.

J. J. McLaughlin, 27, Norman Road, Ashford, Middx., electrical engineer.—Public examination 24th September at the Law Courts, Windsor Road, Slough, Bucks.

H. S. Page, 109, Market Street, Westhoughton, Lancs., radio, electrical and toys retailer.—Trustee, Mr. A. T. Eaves, 47, Mosley Street, Manchester, 2, released 23rd June.

C. G. Carder, 2, Bone Hill, Buckingham, electrician.—Second and final dividend of 2¼d in the £, payable at 58-61, York Terrace, Regent's Park, London, N.W.1.

Streatham Electrics, 78, Upper Tulse Hill, Streatham, London, S.W.2, electrical contractors.—Receiving order made 9th July on a creditor's petition.

C. S. Smith, residing and lately carrying on business at 9, Pedder Street, Morecambe and Heysham, Lancs., electrical engineer and contractor.—Receiving order made 10th July on debtor's own petition.

J. Darwen, residing at 35, Barlow Lane, Reddish, electrical engineer, formerly carrying on business at Dane Bank House Works, Windmill Lane, Denton, Lancs., previously carrying on business at 23, Reddish Lane, Gorton, Manchester, as an electrical contractor.—Public examination 22nd September at the Town Hall, Ashton-under-Lyne.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 2nd August:

CAPRICE. No. 773,787. Class 9. Radio receivers.—Pilot Radio, Ltd., 31-37, Park Royal Road, London, N.W.10.

FERROLUX. No. 773,926. Class 9. Electrodes for electric arc welding.—Quasi-Arc, Ltd., Bridgewater House, Cleveland Row, St. James's, London, S.W.1.

TROIDAC. No. 775,923. Class 9. Transformers and voltage regulators, all being electric.—Foster Transformers, Ltd., Morden Road, South Wimbledon, London, S.W.19.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1950

28911. United Kingdom Atomic Energy Authority.—Fuel elements for nuclear reactors. 27th November, 1951. (798434.)

1953

13891. Cambridge Instruments Co., Ltd., and Beck, H. V.—Electrical supply systems comprising oscillation generators. 18th August, 1954. (798572.)

32881. Metropolitan-Vickers Electrical Co., Ltd.—Apparatus for de-coding record card and like elements. 22nd November, 1954. (798670.)

34324. Thorn Electrical Industries, Ltd. —Electroluminescent lamps. 15th November, 1954. (798503.)

34754. Sparcatron, Ltd.—Methods and apparatus for cutting electrically conductive materials. 20th December, 1955. (798609.)

1954

13633 and 19520. Thorn Electrical Industries, Ltd.—Electroluminescent devices. 4th and 26th May, 1955. (798504/5.)

21297. Burndept, Ltd.—Voltaic cells. 21st July, 1955. (798452.)

22649. Landis & Gyr Akt.-Ges.—Material for electric resistances and process of manufacture thereof. 4th August, 1954. (798721.)

31083. Ferranti, Ltd.—Electrical apparatus for indicating the departure of a variable quantity from a given range of values. 21st October, 1955. (798413.)

36603. Skillman & Co., Pty., Ltd., T. S. —Apparatus for testing and controlling electrical circuits. 17th December, 1954. (798571.)

36758. Philips Electrical Industries, Ltd. —Semi-conductor devices. 20th December, 1954. (798625.)

37545. Micafil Akt.-Ges.—Core holding and feeding devices for coil winding machines. 29th December, 1954. (798688.)

1955

1890. Fernseh Ges.—Electric amplifiers. 21st January, 1955. (798549.)

3224. Siemens-Schuckertwerke Akt.-Ges. —Semi-conductor modulating device. 3rd February, 1955. (Addition to 797505.) (798671.)

3418. General Electric Co.—Magnetic amplifiers. 4th February, 1955. (798416.)

5551. Cutler-Hammer, Inc.—Snap-action electric switches. 24th February, 1955. (798436.)

6826. Soc. Nouvelle de l'Outillage R.B.V. et de la Radio-Industrie.—Distant synchronisation of television equipment. 8th March, 1955. (798552.)

9055. Telefonaktiebolaget L. M. Ericsson.—Automatic telephone exchanges providing automatic transfer service. 28th March, 1955. (798749.)

11113. General Electric Co., Ltd.—Image converting devices. 12th April, 1956. (798724.)

12518. Siemens & Halske Akt.-Ges.— Processes and apparatus for electrolytic shaping. 29th April, 1955. (798691.)

13299. Marconi's Wireless Telegraph Co., Ltd.—Ultra-high frequency velocity-modulated oscillator circuits. 8th February, 1956. (798522.)

14932. Patelhold Patentverwertungs- & Elektro-Holding Akt.-Ges.—Electric discharge devices. 24th May, 1955. (798751.)

17088. Marconi's Wireless Telegraph Co., Ltd.—Balanced modulator circuits. 3rd April, 1956. (798555.)

17136. Metropolitan-Vickers Electrical Co., Ltd.—Dynamo-electric machines. 30th May, 1956. (798693.)

17311. Thorn Electrical Industries, Ltd. —Electroluminescent devices. 8th June, 1956. (798506.)

17999. M-O Valve Co., Ltd., and Isaacs, G. G.—Gas-filled electric discharge devices. 21st June, 1956. (798627.)

18316. Marconi's Wireless Telegraph Co., Ltd.—Thermionic valve amplifiers and oscillators. 11th April, 1956. (798588.)

19321. Licentia Patent-Verwaltungs-Ges. —Electric control amplifier. 4th July, 1955. (798418.)

19422. British Thomson-Houston Co., Ltd.—Position indicating arrangements. 5th July, 1956. (798397.)

20213. Electric & Musical Industries, Ltd. —Charge storage pick-up tubes. 4th July, 1956. (798628.)

21512. British Central Electrical Co., Ltd., and Krimholtz, J.—Electrical testing apparatus. 25th October, 1956. (798557.)

21745. Planer, Ltd., G. V.—Electrical resistors and other electrical circuit elements. 24th October, 1956. (798696.)

23683. British Relay Wireless, Ltd.— Suspension of electric cables. 17th August, 1956. (798699.)

24479. General Electric Co.—Transistor amplifier circuits. 25th August, 1955. (798523.)

25095. Standard Telephones & Cables, Ltd.—Electrical high frequency transmission line filter arrangements. 4th July, 1956. (798629.)

26993. Pye, Ltd.—Cable equalising circuits. 19th September, 1956. (798401.)

27571. Loblite, Ltd.—Electrical sockets. 28th December, 1956. (798647.)

28546. Sylvania Electric Products, Inc.— Manufacture of high pressure mercury discharge lamps. 6th October, 1955. (798631.)

29548. Radio Heaters, Ltd.—Radio frequency dielectric heating apparatus. 23rd August, 1956. (798756.)

30182. General Electric Co., Ltd.— Apparatus for automatically controlling the operation of a punch tool machine. 22nd October, 1956. (798702.)

34216. Parsons & Co., Ltd., C. A.— Nuclear reactors. 21st December, 1956. (798466.)

35262. Philips Electrical Industries, Ltd. —Sound reproducing devices producing artificial reverberation of recorded sound. 8th December, 1955. (798440.)

36679. Ultra Electric, Ltd.—Method of and apparatus for soldering printed circuits. 21st December, 1956. (Cognate application 7411, 9th March, 1956.) (798454.)

37135. Hobson, Ltd., H. M., Fellows, H., and Head, R. E. A.—Frequency dividing circuits. 27th June, 1956. (798508.)

1956

1521. United Kingdom Atomic Energy Authority.—Heat transfer systems. 16th January, 1957. (798441.)

3338. British Thomson-Houston Co., Ltd.—Electric motor control systems. 29th January, 1957. (798654.)

5566. Harvest Saver & Implement Co., Ltd.—Electrical insulators. 22nd February, 1957. (798759.)

7037. Babcock & Wilcox Co.—Heat-exchanger and method of making same. 6th March, 1956. (798707.)

10582. Philips Electrical Industries, Ltd. —Electronic amplifiers. 6th April, 1956. (798731.)

11372. Hughes Aircraft Co.—Transistor memory circuit. 13th April, 1956. (798578.)

11404. General Electric Co., Ltd.— Positioning mechanisms for mine winder cages or the like. 12th April, 1957. (798760.)

13590. I-T-E Circuit Breaker Co.— Securing of an element such as a turbine blade to a body such as a rotor. 2nd May, 1956. (798613.)

14877. Telefunken Ges.—Travelling wave tubes. 14th May, 1956. (798622.)

15002. Soc. Industrielle de Liaisons Electriques.—Method of protecting the sheathings of electric cables. 14th May, 1956. (798623.)

15592. General Electric Co.—Temperature responsive control systems. 18th May, 1956. (798763.)

19083. Babcock & Wilcox, Ltd.—Cyclone furnaces and a method of operating a cyclone furnace to generate heat. 20th June, 1956. (798494.)

20455. Compagnie Générale de Télégraphie sans Fil.—Photosensitive storage tube arrangements. 2nd July, 1956. (798400.)

20602. Dishmaster Appliances, Ltd.— Washing machines. 3rd July, 1956. (798530.)

21702. Sola Electric Co.—Electric power supply apparatus. 13th July, 1956. (798764.)

21947. Maxson Corporation, W. L.— Snap-action electric switches. 16th July, 1956. (798638.)

22747. Petercem. — Electromagnetically operated switches. 23rd July, 1956. (798445.)

23280. Bailey Meters & Controls, Ltd.— Telemetering systems. 27th July, 1956. (798496.)

23757. Robertshaw-Fulton Controls Co.— Transducers. 1st August, 1956. (798594.)

24482. Knorr-Bremse Ges.—Coupling devices for fluid conduits and electric cables. 9th August, 1956. (798470.)

25558. Collins Radio Co.—Temperature compensating means for a tuned circuit. 21st August, 1956. (798735.)

27474. General Electric Co.—Electric discharge devices. 7th September, 1956. (798639.)

30429. Philips Electrical Industries, Ltd. —Radiation monitors. 5th October, 1956. (798595.)

30882. Aktiebolaget Svenska Fläkfabriken. —Electrostatic precipitators. 10th October, 1956. (798661.)

32877. Mallory & Co., Inc., P. R.— Primary electric cell. 29th October, 1956. (798449.)

33518. Philips Electrical Industries, Ltd. —Containers for an electrical component which are sealed by means of a cover and a hardened sealing resin. 2nd November, 1956. (798664.)

33765. Electricité de France.—Electric cables equipped with insulation under pressure. 5th November, 1956. (798665.)

33772. Gaylord Products, Inc.—Speed-responsive electric switch actuating device. 5th November, 1956. (798736.)

35949. Telefonaktiebolaget L. M. Ericsson.—Balanced mixing arrangements for microwave transmission. 23rd November, 1956. (798534.)

36679. Standard Telephones & Cables, Ltd.—Arrangement for correcting picture distortion in cathode-ray tubes. 30th November, 1956. (798408.)

1957

4380. Osnabrücker Kupfer- und Drahtwerk.—Metal-sheathed electric cables. 8th February, 1957. (798520.)

6731. Petercem.—Electric thermostats. 28th February, 1957. (798537.)

7991. Smit & Co.'s Transformatorenfabrik N.V., W.—Electric throw-over switches. 11th March, 1957. (798740.)

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CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia. — Snowy Mountains Hydro-Electric Authority, Cooma North, N.S.W. 10th September. Automatic load-frequency control equipment. (E.S.B. 17149/58. Ten/33517.)*

Burma.—Electricity Supply Board, Rangoon. 31st July. Electric domestic and industrial apparatus and material. (E.S.B. 18077/58. Ten/33567.)*

Croydon.—Corporation. 11th August. Street lighting equipment. (See this issue.)

Durham.—County Council. 1st August. Equipment for mechanical and electrical engineering at Durham Technical College. G. H. Metcalfe, Director of Education, Shire Hall.

Ecuador.—Amato Cantonal Council. 8th September. Hydro-electric equipment, including three 800 h.p. turbines and 1,500 kW unit. (E.S.B. 18027/58. Ten/33611.)*

Greece. — State Procurements Service, Athens. 31st July. Magnet wires. (E.S.B. 17997/58. Ten/33600.)*

India.—Director General of Supplies and Disposals, New Delhi. 8th August. Industrial X-ray equipment. (E.S.B. 18335/58. Ten/33639.)*

Madras Port Trust. 2nd September. H.v. cables. 8th September. Four 300 kVA transformers. (See this issue.)

Damodar Valley Corporation, Calcutta. 21st August. Motor lockout switches for 3 kV and 400 V motors. (See this issue.)

Iraq. — Directorate General of Civil Aviation, Baghdad. 15th August. Radio telegraph/telephone transmitters. (E.S.B. 17335/58. Ten/33487.)*

New Zealand.—Hamilton City Council. 30th July. Underground cable. (E.S.B. 17924/58. Ten/33530.)*

Auckland Power Board. 15th August. H.v. cable. (E.S.B. 17993/58. Ten/33563.)*

G.P.O., Wellington. 18th August. Signal generators, oscillators and pulse generators. (E.S.B. 17347/58. Ten/33489.)* 22nd August. Attenuators, potentiometers and audio filters. (E.S.B. 17297/58. Ten/33488.)* 26th August. Electrical insulation testers. (E.S.B. 18051/58. Ten/33558.)* 1st September. Coaxial cable. (E.S.B. 18115/58. Ten/33588.)*

Wellington Corporation. 18th August. Street lighting lanterns. (E.S.B. 18067/58. Ten/33570.)*

Pakistan.—Government Department of Supply and Development, Chittagong. 4th August. Three 50 kW diesel-driven generating sets. (E.S.B. 18587/58. Ten/33680.)*

Director General, Department of Supply and Development, Karachi. 13th August. Ten electric drills. (E.S.B. 17948/58. Ten/33566.)*

Rhodesia and Nyasaland.—Federal Tender Board, Causeway. 1st August. Insulated hard drawn copper wire. (E.S.B. 18041/58. Ten/33569.)*

South Africa.—Union Tender and Supplies Board, Pretoria. 31st July. Electric cable. (E.S.B. 17931/58. Ten/33554.)* 7th August. Radar reflectors and hydrogen-generator charges. (E.S.B. 17935/58. Ten/33592.)* Electrically operated reagent feeders and electric motors. (E.S.B. 18359/58. Ten/33647.)*

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

Stores Department, South African Railways, Johannesburg. 1st August. Pumping plant, including two electrically driven centrifugal pumps. (E.S.B. 18408/58. Ten/33628.)* 760 telephones. (E.S.B. 18402/58. Ten/33635.)* Mobile radio telephone equipment. (E.S.B. 18406/58. Ten/33645.)* 6th August. Micanite commutator sheet. (E.S.B. 17553/58. Ten/33507.)* 8th August. Underground armoured cable. (E.S.B. 17555/58. Ten/33518.)*

Provincial Administration for the Cape of Good Hope. 5th August. X-ray apparatus. (E.S.B. 17706/58. Ten/33520.)*

Staffordshire.—County Council. Contractors desirous of being added to approved lists of contractors for electrical, heating and maintenance works, for the County Architect's Department should apply by 31st July. County architect, Lichfield Road, Stafford.

Stockport.—Corporation. 8th September. Electric lighting and power installation at Town Hall. (See this issue.)

Sudan.—Ministry of Works Stores Section, Khartoum. 2nd August. Ceiling fans. (E.S.B. 18072/58. Ten/33561.)*

Thailand.—Post and Telegraph Department, Bangkok. 13th August. Precision frequency measuring equipment and communication type radio receiving sets. (E.S.B. 17873/58. Ten/33543.)*

United States.—Public Utility District No. 1, Chelan County, Washington. 1st August. Equipment for 115 kV switchyard. (E.S.B. 18387/58. Ten/33646.)*

Westmeath.—County Council. 8th August. Pumping plant. (E.S.B. 17879/58. Ten/33579.)*

Wolverhampton.—Corporation. 31st July. Passenger lifts and lightning conductors in connection with the Dale Street redevelopment. Borough engineer, Town Hall.

Worksop.—Corporation. 11th August. Street lighting equipment. (See this issue.)

ORDERS PLACED

Acton.—Works Committee. Recommended. Installation of sodium street lighting in a number of roads and fluorescent lighting in other roads (£61,587).—Revo Electric Co.

Bradford.—Public Works Committee. Electrical installations in 100 dwellings at Reevy Avenue, Buttershaw estate (£2,698).—Hobson & Scott.

Gateshead.—Corporation. Electrical installation in Girls' Department at Hill Heads Secondary Modern School (£4,448).—Wall Brothers (Radio-Electric).

Glasgow. — British Railways, Scottish Region. Cabling of telecommunications and supervisory circuits, Airdrie-Helensburgh line and associated branches.—Standard Telephones & Cables, Ltd. Electric colour-light signalling, Kelvinhaugh-Dalmuir Park via Clydebank Central.—Metropolitan-Vickers-G.R.S., Ltd.

Middlesex.—County Education Committee. Renewal of electrical installation at Priory School, Acton (£4,237).—Electrical Contracting Co.

Newbury.—Highways Committee. Lighting of east-west relief road: Lanterns and control gear (£1,096).—Engineering & Lighting Equipment Co. Supply and erection of columns (£4,136).—Machinery Installations.

Newcastle-on-Tyne.—Regional Hospital Board. The following tenders for electrical work in hospitals have been accepted:—Morpeth Cottage Hospital (£3,313).—Robson & Coleman. Bensham Hospital, Gateshead (£2,517).—Bonham Electric Co.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Aylesbury.—Houses (38); Webster & Cannon, builders, Cambridge Street, Aylesbury.

Biddenham. — R.C. secondary school; Lindum, Ltd., builders, Hempston Road, Bedford.

Birkenhead.—Hotel, Overchurch estate; Rees & Holt, architects, 64, Rodney Street, Liverpool.

Birmingham. — Four-storey maisonnettes, Cromwell Street, and blocks of nine-storey flats; A. G. Sheppard Fidler, city architect, Civic Centre, 1.

Brixham.—Houses (100), Churston Way estate; Ideal Builders, Ltd., 19, Bolton Street.

Caernarvon.—Chemical works, Glynfillon Park; Ashburton Chemicals, Ltd., Manchester, 17.

Chelmsford.—Private houses (292), Moulsham Lodge estate; W. Goodchild & Co., surveyors to developers, 123, South Street, Romford.

Cheltenham.—Maisonnettes (54), Hesters Way estate; borough surveyor.

Chester.—R.C. church, Hawthorne Road, Lache estate; Reynolds & Scott, architects, 9, Albert Square, Manchester.

Chesterfield.—Further 100 houses, Dunston Hall estate; borough engineer.

Cleator Moor (Cumberland).—R.C. infants' and junior school (first instalment); Border Engineering Contractors, Ltd., builders, Queen Street, Whitehaven.

Colchester.—Junior school, Prettygate; T. J. Evers, Ltd., builders, New Road, Tiptree.

Dudley.—Houses (165), Russell's Hall estate; F. H. Gibbons, borough engineer, Council House.

Dunstable.—Houses (465), Croft estate; John & David Martin, Ltd., builders, Lower Road, Queensbury, Middx.

Additional factory premises; Bagshawe & Co., Ltd., Luton Road.

Durham.—New schools at Billingham, Egglescliffe, Peterlee, Hebburn, Framwellgate Moor, Stockton, and Whickham (1959-60 programme); county architect, South Street, Durham.

Infants' school at Spennymoor (£40,000); A. Gilmore, Ltd., builders, St. Oswald's Drive, Durham.

Edinburgh.—Eight shops, Groathill Road North (£24,000); D. B. Gunn (Builders), Ltd., 16, Young Street.

Enfield.—Works extensions for Thomas Morson & Sons, Ltd.; Turriff Construction Corpn., Ltd., Budbrooke Road, Warwick.

Esher.—Dwellings at Farm Road (55), Walton Road, West Molesey (30) and Ray Road, West Molesey (14); F. Edwards, clerk, Council Offices, Esher, Surrey.

Falkirk.—Cinema and ballroom, High Street/Callender Riggs site; Gavin Paterson & Son, architects, West Regent Street, Glasgow.

Gateshead.—Four-storey office block at Team Valley trading estate for British Road Services; John Laing & Sons, builders, Dalston Road, Carlisle.

Proposed Elgin Secondary Technical School (£200,000); borough engineer.

[*Continued on page* 186

Work in Prospect—(*continued*)

Gosport.—Flats (36), Great Haslar Street; Selleck, Nicholls & Co., Ltd., builders, East Hill, St. Austell.

High Wycombe.—Office block, High Street; Brown & Clarke, Ltd., builders, Great Missenden.

Huddersfield.—Phase 2 of technical training college, Lindley; borough architect, High Street Buildings.

Hull.—Central laundry at Netherhall, Sutton; A. Rankine, city architect, Guildhall.

Kidderminster.—Housing units (94), Broad Street redevelopment; J. G. Stewart, borough engineer, 110, Mill Street.

Leeds.—Depot for ice cream and meat products, Limewood Approach, Seacroft; T. Wall & Sons, Ltd., Easy Road, Leeds, 9.

Liverpool. — Psychiatric unit, Sefton General Hospital; Morter & Dobie, architects, 2, Exchange Street East.

London.—Office block, Ludgate Hill; Theo H. Birks, architect, 38, Portland Place, W.1.

Central Library, Theobald's Road; borough architect.

Showrooms and offices, Praed Street, Paddington; Brian L. Sutcliffe & Partners, architects, 5, Manchester Square, W.1.

Premises for poultry market, Smithfield (£60,000); Gee, Walker & Slater, Ltd., builders, 100, Park Lane, W.1.

Manchester.—Flats (32), Wilmslow Road, Fallowfield; Mather & Nutt, architects, 103, Portland Street.

Newcastle-on-Tyne. — Light engineering factory, St. Lawrence Road; Sheldon Wilson Eng. Co., Anderson Buildings, Market Street, Newcastle.

Norwich.—Showrooms and offices for Elvedon estates; Thomas Gill & Son, Ltd., builders, Hall Road.

Oxford.—First phase of Metallurgy Department for University; W. J. Whittall & Son, Ltd., builders, 132, Lancaster Street, Birmingham, 4.

Pontypool. — Houses (62), Trevethin; architect, Market Buildings, Crane Street.

Rotherham.—Houses (186), Kimberworth Park estate; borough engineer, Municipal Offices.

Scunthorpe. — Grammar-technical school (£187,000); R. M. Phillips & Sons, Ltd., builders, Estate Yard, Brigg.

South Shields.—Warehouse and office block, Simonside estate, for S.P.D., Ltd.; F. S. Snow & Partners, consulting engineers, Monro Building, Wellington Street, London, W.C.2.

Houses (74), Brinkburn site; Whittal, Ltd., builders, 95, Pilgrim Street, Newcastle-on-Tyne.

Southwick.—Flats (36), Fishergate; K. A. Hawkes, Ltd., builders, 25, Railway Street, Gillingham.

St. Albans.—Operating theatre block, City Hospital; Tooley & Foster, architects, Midland Bank Chambers, Buckhurst Hill.

Stamford.—Three-storey block of buildings, St. Paul's Street, for Stamford Endowed Schools; F. J. Lenton & Partners, architects to Governors, 16, Broad Street.

Tunbridge Wells.—Factory for Systematic Tooling, Ltd.; Elliott, Cox & Partners, architects, 172, Buckingham Palace Road, London, S.W.1.

West Hartlepool.—New fire station (second stage) (£16,000); W. W. Brazell, Ltd., builders, Raeburn Street.

Houses (87); A. G. Sinclair, borough architect.

Weymouth and Melcombe Regis.—Development of Lodmoor area, comprising shops, licensed premises, hotels, café, motel, entertainments building, holiday camp, etc.; borough engineer, 6, Pulteney Buildings, Weymouth.

Worsley.—Houses (62), Grosvenor Road and Old Clough Lane, for U.D.C.; C. Jeffries, builder, 3, Entwistle Avenue, Davyhulme, Urmston, Manchester.

FORTHCOMING EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

The holiday month of August invariably shows a falling off in events of electrical interest, but there are a number of arrangements in the near future and readers may wish to make note of these. In addition to immediate events, therefore, we also give below those which have been arranged between now and the end of September.

Thursday, 17th July, to Thursday, 27th September

CARDIFF.—Cardiff Castle. *Daily Telegraph* "Son et Lumière."

Tuesday, 29th July

LONDON.—Connaught Rooms, W.C.2, 12.30 for 1 p.m. Radio Industry Club. Luncheon.

Wednesday, 30th July

LONDON.—Connaught Rooms, Great Queen Street, W.C.2, 12.30 for 12.55 p.m. Batti-Wallahs' Society. Luncheon. Guest speaker, Sir Roy Gill.

Thursday, 31st July, to Saturday, 11th October

GREENWICH.—*Daily Telegraph* "Son et Lumière."

Wednesday, 27th August, to Wednesday, 3rd September

GLASGOW. — British Association for the Advancement of Science. Annual meeting.

Wednesday, 27th August, to Saturday, 6th September

LONDON.—Earls Court. National Radio and Television Exhibition.

Tuesday, 2nd September, to Thursday, 11th September

LONDON.—Olympia. Domestic Equipment Trades Fair.

Tuesday, 16th September, to Friday, 19th September

HARROGATE.—Association of Public Lighting Engineers. Annual conference.

Monday, 22nd September, to Saturday, 27th September

MANCHESTER.—City Hall. National Business Efficiency Exhibition.

Tuesday, 23rd September

LONDON.—Caxton Hall. A.S.E.E. Electrical Engineers Exhibition. Ballot meeting.

Wednesday, 24th September, to Friday, 3rd October

LONDON. — Olympia. Industrial Fuel Efficiency Exhibition.

Friday, 26th September, to Saturday, 4th October

LONDON.—Earls Court. Commercial Motor Show.

STREET LIGHTING NOTES

During the last quarter Mr. Henry Brooke, the Minister of Housing and Local Government, has authorised local authorities to borrow £908,481 for public lighting.

Tynemouth Town Council is to convert street lighting in Howdon Road, North Shields, from gas to electricity.

Darlington Town Council has applied to the Ministry for sanction to borrow £3,620 for electric street lighting on the Skerne Park estate. The borough engineer (G. S. Short) has reported that it will cost more than £6,600 to bring street lighting on the various estates up to present-day standards.

A contract has been awarded by **Belfast** City Council to Siemens Edison Swan, Ltd., covering the provision of 170 street lanterns of a new design, to be known as "Corporation A," for an extension of the Royal Avenue installation. The lanterns will each accommodate three 50ft 80 W lamps and will have aluminium alloy castings of 2L33, which is the Admiralty-approved aluminium for use in salt-laden atmospheres. The finish is in "Haligloss" spatter grey paint. Another contract for Siemens Edison Swan is for 90 three-lamp 4ft "Court" type lanterns at **Carrickfergus.** Installations of Crawley 2ft lanterns are being carried out at **Castlereagh** and **Newry.**

Ministry approval has been obtained for **Peterborough's** street lighting improvement scheme covering the city centre and Lincoln Road north of Marholm Road. The estimated cost is £11,400.

Whitley Bay.—Preliminary work is in hand on the proposed conversion of street lighting on the Red House estate from gas to electricity. This is part of a £60,000 scheme drawn up by the Town Council for converting all street lighting in the town to electricity.

In his annual report Mr. Rowland Nicholas, city surveyor and engineer, **Manchester,** says that the lighting of the city's major traffic routes has undergone very little change since 1939. However, during 1956-57 the first real steps were taken to improve the poorly lighted routes and over 400 new positions were installed in this programme alone. The conversion of the gas lighting proceeded at a slightly lower rate than in the previous year, the programme undertaken totalling about 1,400 positions.

Portsmouth Roads, Works and Drainage Committee has approved the provision of sodium lighting in a number of streets during 1958-59 at an estimated cost of £7,510.

Edinburgh City Council reports the receipt of sanction to borrow £50,000 for its 1958-59 street lighting programme.

Electric street lighting schemes in seven areas costing over £23,000 have been approved in principle by **Sunderland** Town Council and the Ministry of Housing and Local Government is being asked for loan sanction. The biggest item is £10,000 for converting lighting in the Fulwell area from gas to electricity.

Nottingham Lighting Committee has approved schemes for the improvement of street lighting in Mansfield Road (£1,840), Sherwood Rise and Nottingham Road (£1,290), Radford Road (£1,150), and Wollaton Road (£1,460).

Kidderminster Corporation is recommended to approve in principle the carrying out of the first section of a scheme for the modernisation and electrification of the street lighting in all parts of the town, at an estimated cost of £15,500.

Bootle Works Committee has approved a scheme for the conversion of street lighting in side streets in the Orrell area from gas to sodium lighting, at an estimated cost of £10,000.

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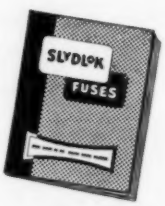

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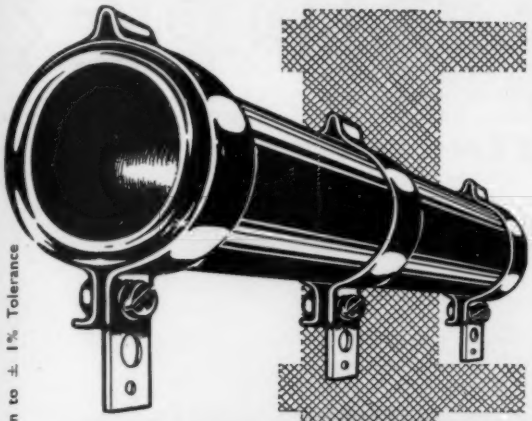

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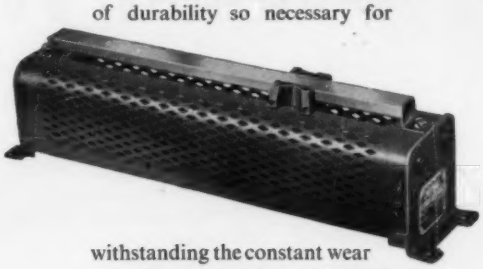

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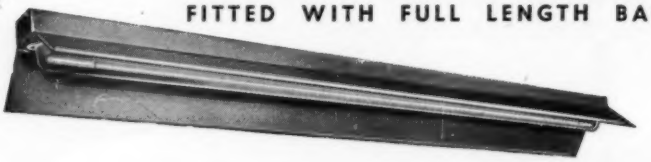

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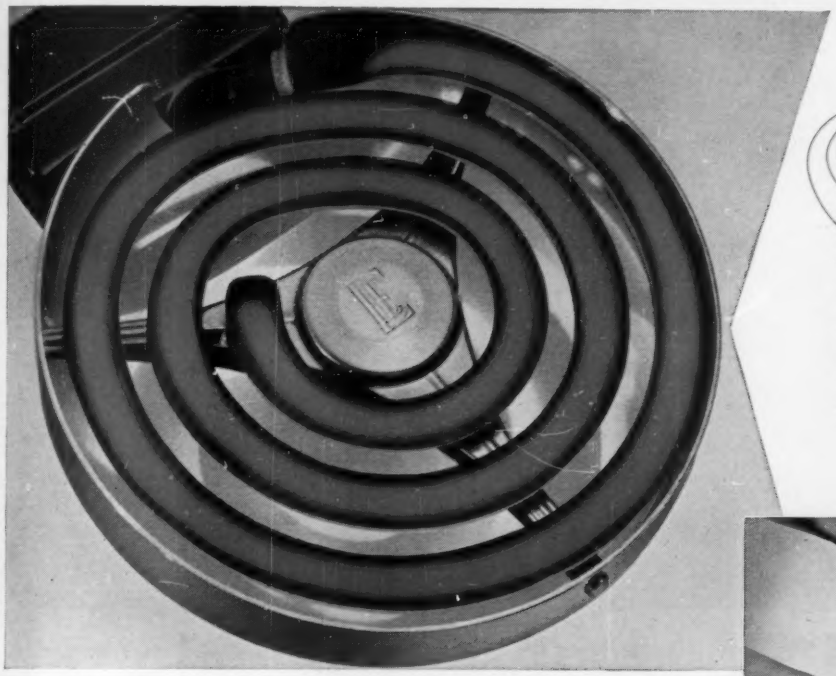

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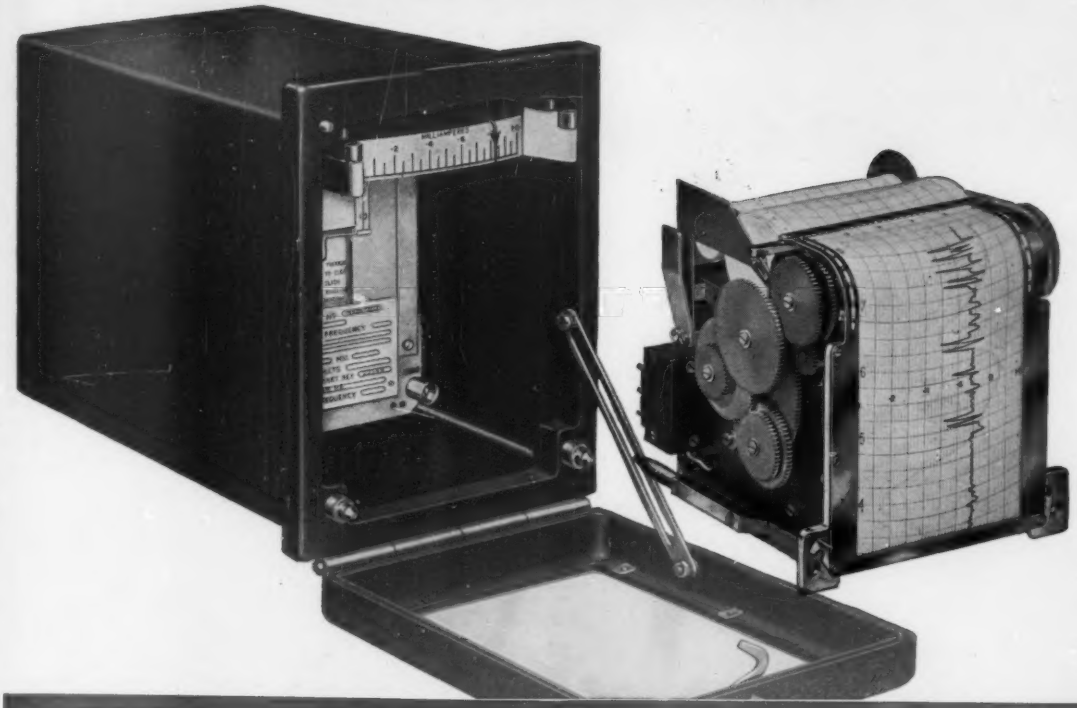

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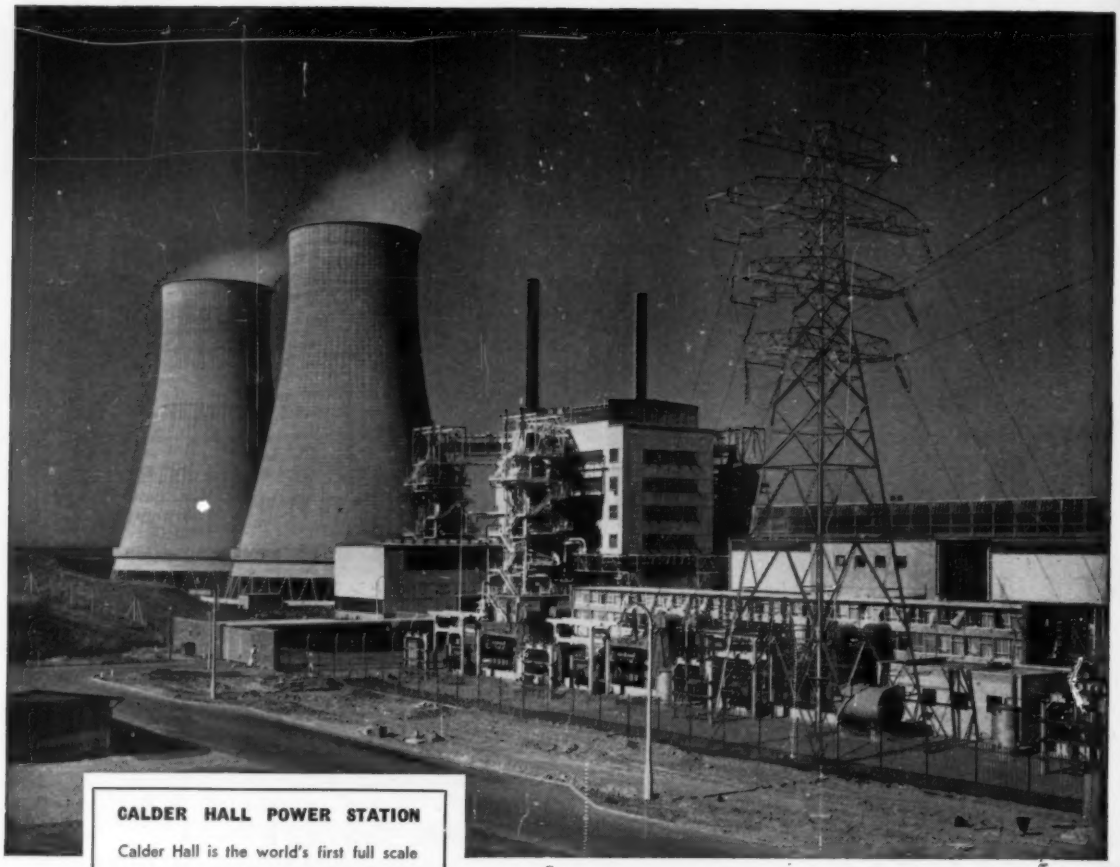

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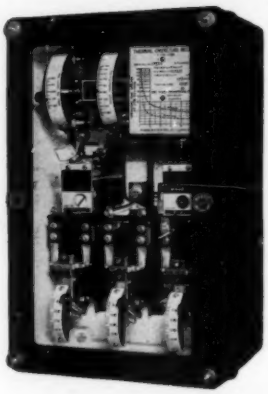

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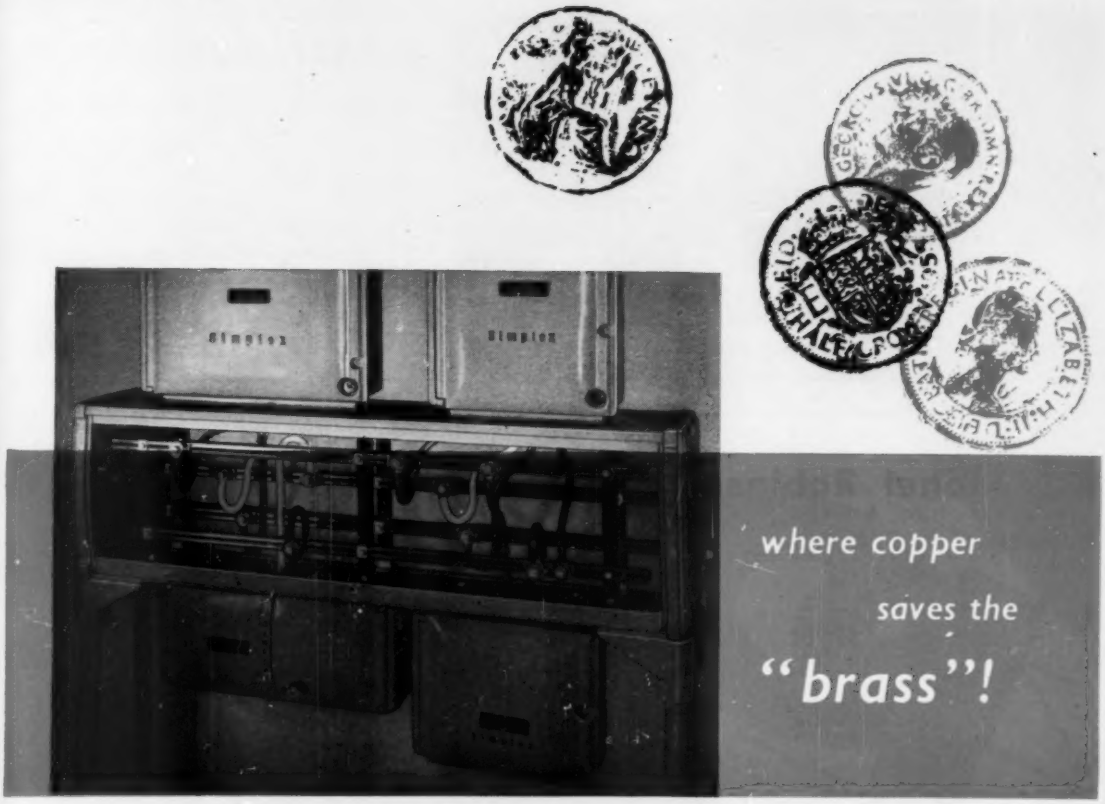

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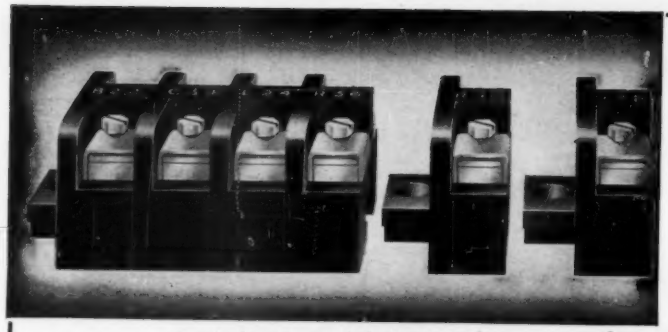

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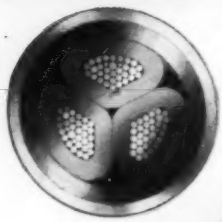
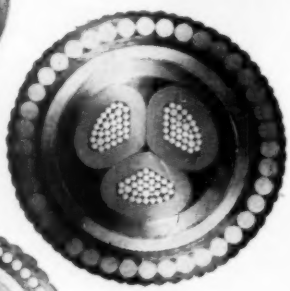
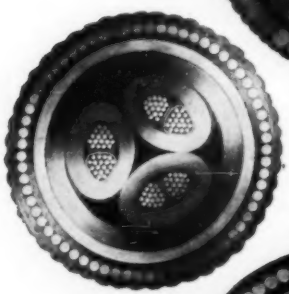


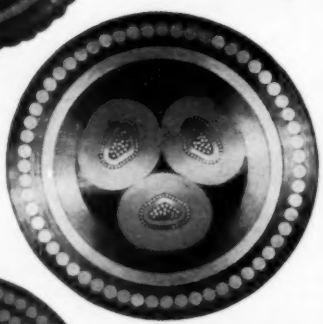
1902 0.25 sq. in. 10kV. cable



1905 0.25 sq. in. 8kV. underwater cable



1912 0.15 sq. in. 20kV. split conductor cable



1913 0.1 sq. in. 20kV. split concentric cable

1913 0.2 sq. in. 11kV. cable

1870 Lead sheathing of rubber insulated cables and wires for lighting installations.

1881 Cables and equipment for Godalming, the first public lighting system installed in a town in Great Britain.

1888 Jute insulated mains cable supplied to Bradford Corporation with lead sheath and armoured with over-lapping iron tapes.

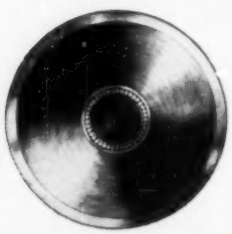
1889 Concentric 250-volt Jute cable with iron wire armour laid underground in the Strand, London.

1900 First impregnated paper cable for 3-wire D.C. low-tension with built-up segmental conductors.

1902 The first steam locomotive track to be electrified: North-Eastern Railway, Newcastle District—37 miles of track. Triple-concentric cables made for London County Council Tramways: 48 miles installed.

1904 Electrification of section of Great Western Railway suburban lines—6,500 and 750 volts.

1905 Underwater H.T. cable laid across Shoreham Harbour, 8,000 volts segmental 3-core type.



1913 Single core 80kV. cable

1927 0.2 sq. in. 22kV. H.S.L. type split concentric cable

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1909 Stannos surface wiring system introduced—conductors enclosed in a tinned copper sheath adapted for concentric wiring.

1913 Electrification of the London and South Western Railway: 92 track miles of 3-core 11 kV cables radiating from Waterloo Station.
20,000 volt 3-core cables supplied for Victoria Railways, Australia, and Central Argentine Railways electrification schemes.
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1925 First long submarine power cable laid at Penang, Malaya: 8,700 yards of 6-core 0.075 sq. in. 12 kV type in one length.

1926 H-type 33 kV cable manufactured. HSL type submarine cables laid across Sydney Harbour.

1927 3-core H-type cables for 33 kV transmission system at Bristol, 39 miles.

1929 83 miles of 3-core 33 kV S.L. cable supplied to Sydney, Australia.

1937 Crossing of River Avon, 3-core 33 kV cables drawn into steel tubes laid on river bed.

1942 Development of HAIS cable for Operation PLUTO: over 200 miles of cable and 280 couplings supplied.

1947 33 kV cables HSL type laid across the Solent to Isle of Wight.

1950 Specially processed non-draining RIND type introduced.

1952 Continuous extruded P.V.C. sheath introduced for power cables as anti-corrosion protection. Over 100 miles of these cables installed in the Aden Oil Refinery in 1953.

1954 P.V.C. insulated and sheathed power cables manufactured with sector-shaped conductors.

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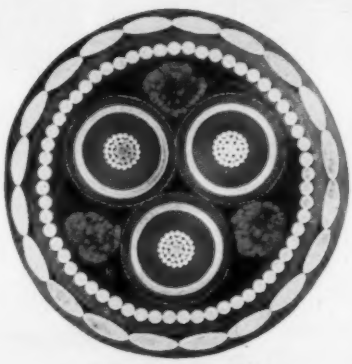
1958 Three lengths, each 2,750 yards, of 3-core 33kV submarine cable made and laid without factory made joints.

1937 0.3 sq. in. 33kV. H type cable



1947 0.25 sq. in. 33kV. H.S.L. type submarine cable

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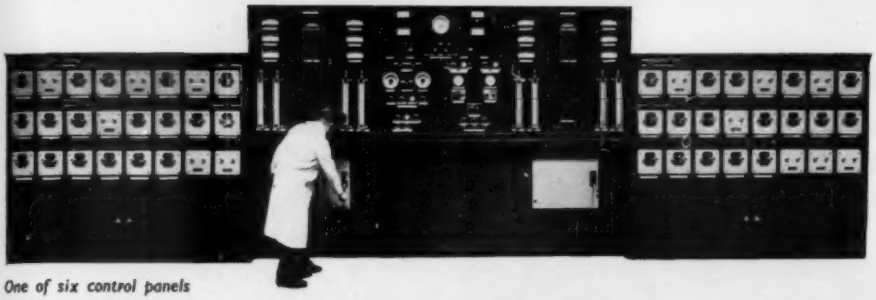

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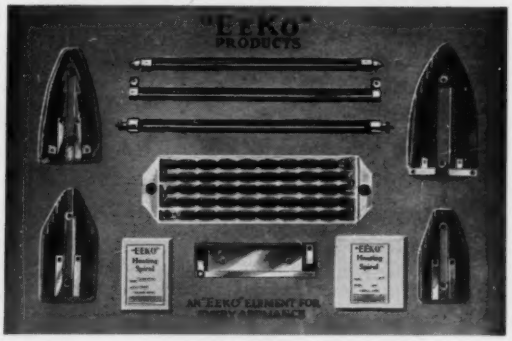

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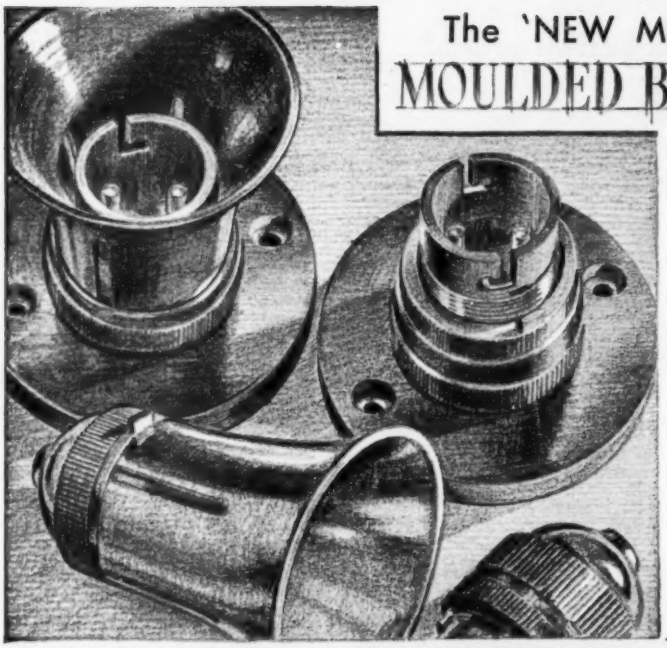

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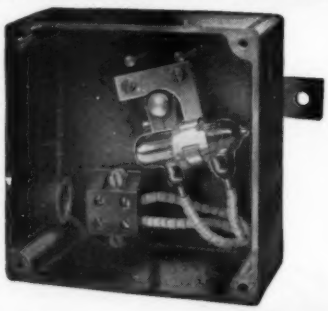

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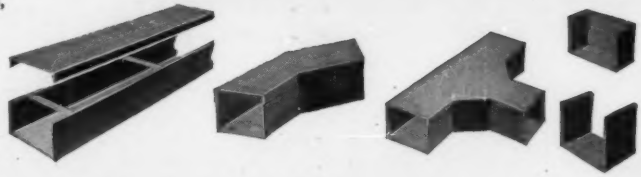

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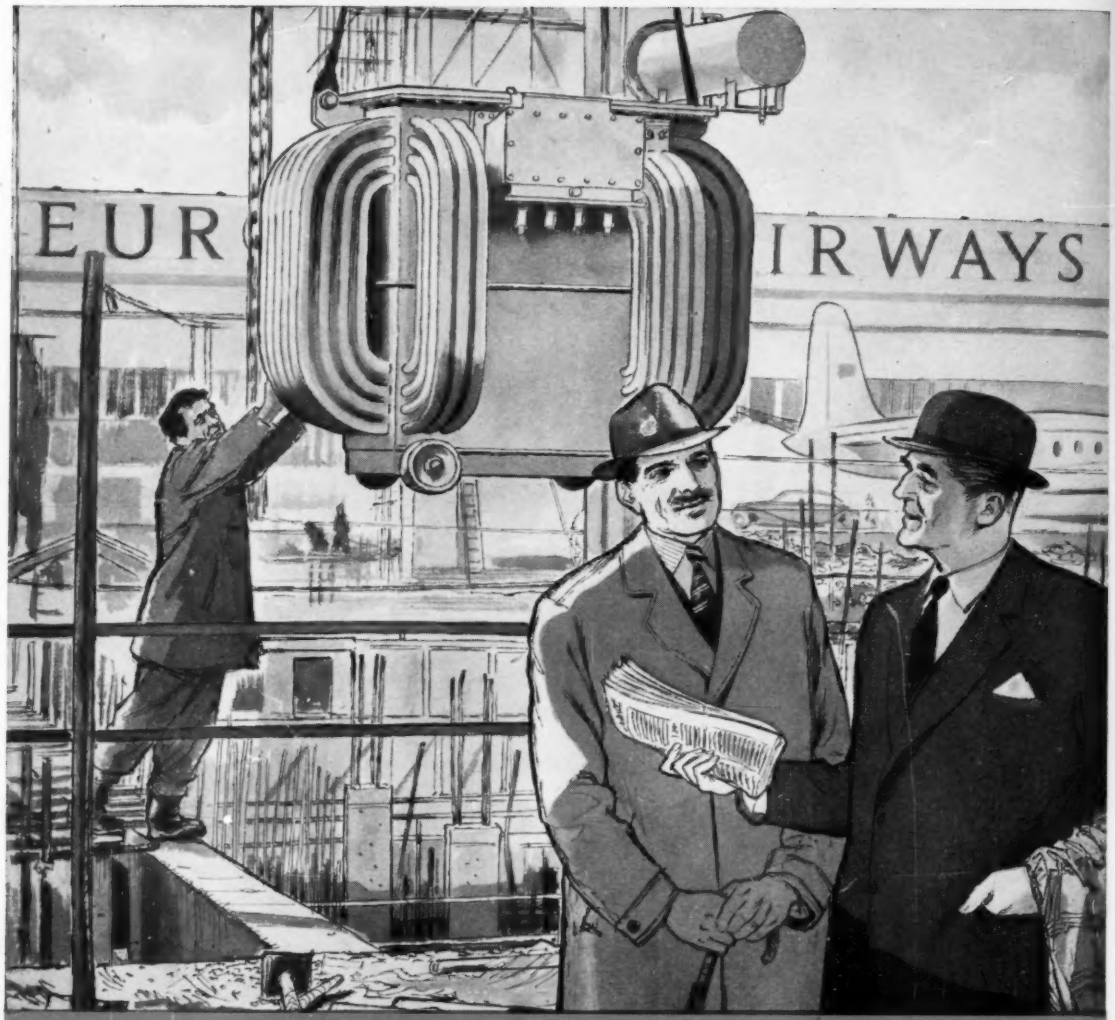

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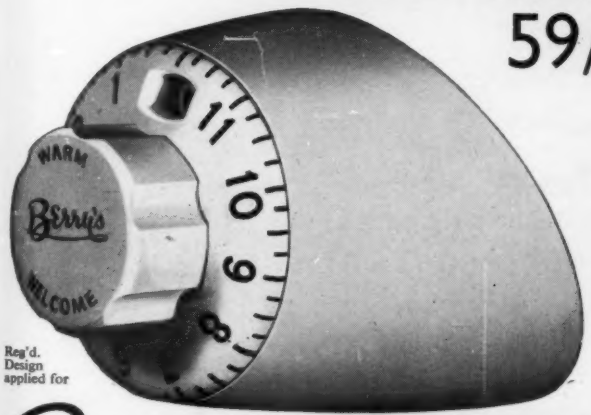

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G

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The water heaters of a lifetime

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Sadia Water Heaters are quick and easy to install. Efficient and economical. From 1¼-gallons to 120-gallons capacity.

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Ferrule or wire end type : full range of 24 sizes — 1½ — 250 watts. List VE. 190.

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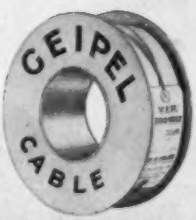

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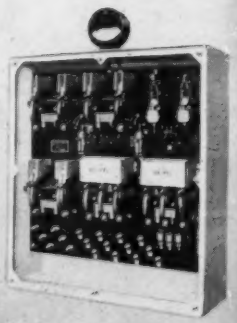

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Wolf-H&S

ELECTRO-MAGNETIC *PRECISION* DRILL STANDS

Type FP6

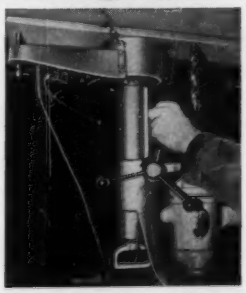
These compact, heavy duty stands transform Wolf portable drills into real precision drilling machines. Easily transportable, they can be used with equal success in production shops or on site work and employed in vertical or overhead drilling in otherwise well nigh impossible positions. The power packed built-in electro-magnets are heavy duty units and the two-stage switch affords a hold-on value for accurate positioning before drilling. The head is movable for sideways adjustment of the drilling position.

Two Models available

TYPE FP5	**£62-10-0**
Price complete with Wolf ½" Heavy Duty Drill	**£83-0-0**
TYPE FP6	**£66-0-0**
Price complete with Wolf ½" Heavy Duty Drill	**£104-0-0**

Supplied complete with 7 yards 3 core T.R.S. cable, safety chain (in case of current failure) and plug top for electric drill.

Available in all standard voltages.



Awkward locations present no problems for the Wolf-H & S Electro-Magnetic precision drill stands.

Write today for full technical details.

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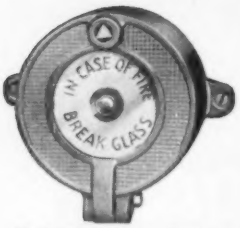

Typical Fire Alarm Contact

Specially designed as a neat, small Fire Alarm Point, with precious metal contacts and substantial springs for **complete** reliability even after years of installation. Each contact will operate a maximum of 3 Strident syrens on 200/250v AC.

PRICE £2. 10s. 0d.

The "Strident" syren is ideal as a Fire Alarm signal and overcomes most noise levels. Only takes ¾ amp with consequent saving in wiring and current consumption. Totally enclosed motor for indoor use only, continuously rated. Base box drilled for ¾" conduit fitted with knockouts and can be turned through 90° to conform to conduit run.

PRICE 200/250 volts AC/DC (¾ amp consumption) **£7. 0. 0.**
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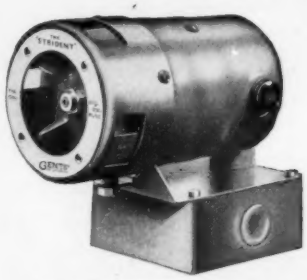
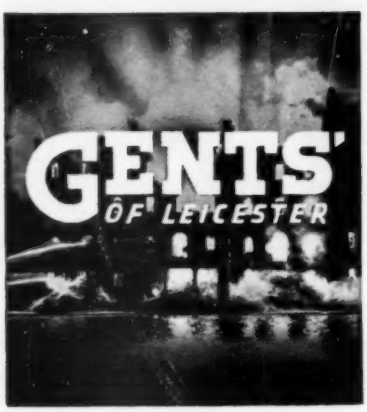


The "STRIDENT" Syren

Alarms



Our informative booklet "Are You Protected?" *will give you further information on Installing Gents' Fire Alarm Systems together with sample schemes. Write for your free copy without delay.*

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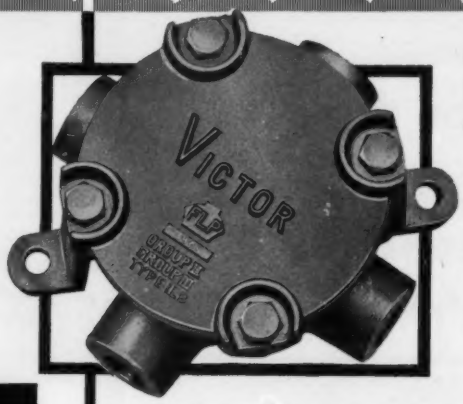

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In the junction box range, similarly independent F.L.P-Weatherproof paths are provided in these, the first fully weatherproofed boxes in the field.

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All voltage measurements a.c. and d.c. are at 10,000 ohms per volt

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a new geared motor

Type DS
smaller
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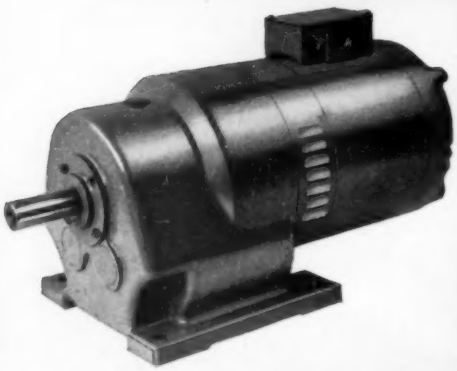

$\frac{1}{6}$, $\frac{1}{4}$, $\frac{1}{3}$, and $\frac{1}{2}$ H.P. Final speeds from 26 r.p.m. to 475 r.p.m. on all A.C. and D.C. voltages. Ball bearing spur gearbox; motor and final shafts coaxial, with the same dimensions for all speeds and voltages.

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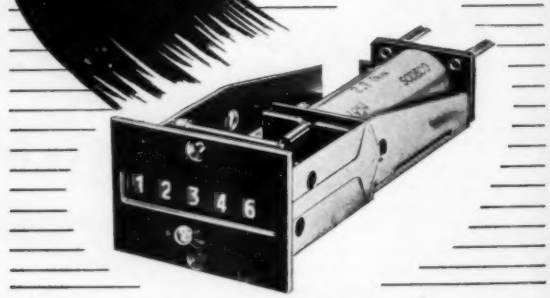

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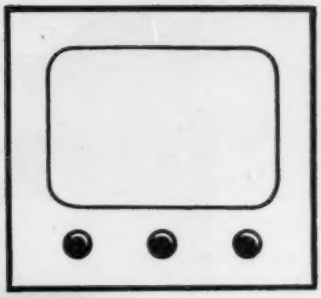

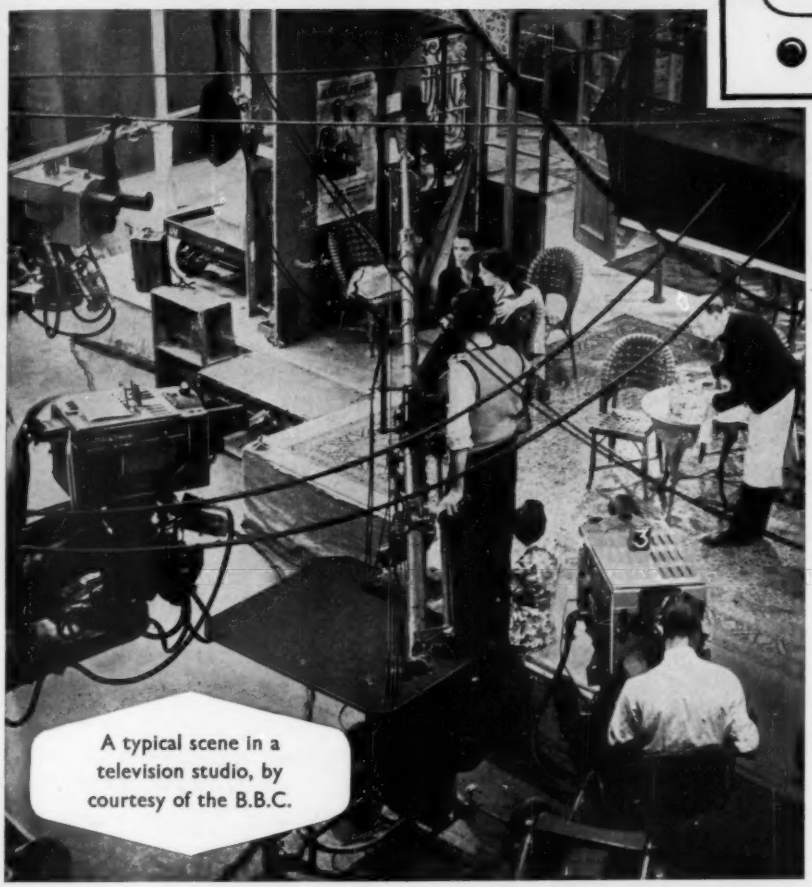

A typical scene in a television studio, by courtesy of the B.B.C.

In a television studio there are cables all over the place.
Your programme depends on these cables being reliable.
We have supplied the B.B.C. and manufacturers with cables for every purpose.
Let reliability decide your choice of cables.

Our range includes –

Aluminium Overhead Cables
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WANDLESIDE CABLES ***for every purpose***

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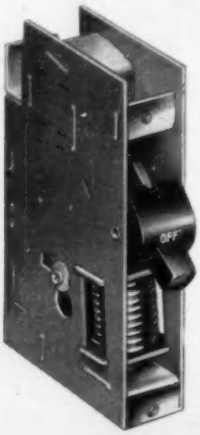
Telephone: VANdyke 7544 (5 lines) Telegrams: Wandleside, London



"A" Series Range 4·5 to 30 amps. catered for by four interchangeable units combining switching facilities and circuit protection in one unit.

The dolly is trip free, cannot be held on against overload. Your safeguard against sustained overload and fault conditions.

Bring your installation up to date now with the protection of the future. **A.C. only.**

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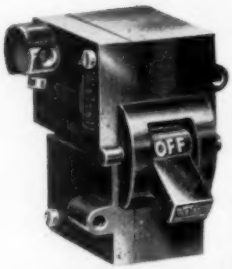
MINIATURE CIRCUIT BREAKERS

GIVE COMPLETE PROTECTION TO CIRCUITS & EQUIPMENT



Designed to provide a compact switching unit with overload protection that will fit into a BSS 1299 box. 133 to 750% rating overload protection by means of Bi-metal.

Heavier fault conditions by means of Electro Magnetic overload coil.

Capable of switching against large initial current as Tungsten Lamp loading. **A.C. only.**

WALSALL CONDUITS LTD

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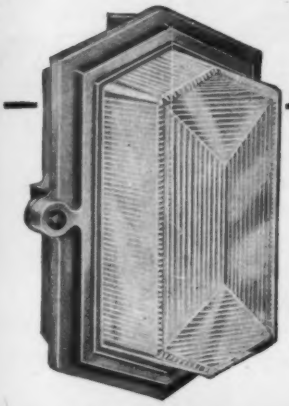

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MAXLUME

PRISMATIC BULKHEAD FITTINGS

NOW REDUCED IN PRICE!

We have pleasure in introducing our new price list showing the latest reductions

MOUNTING	CATALOGUE NUMBER			PRICE
	60/100 WATT		150 WATT	
	WITHOUT GUARD	WITH GUARD		
INTERNAL FIXING	VS.7400	VS.7436	VS.7936	£1 . 12 . 0 £1 . 18 . 0 £2 . 17 . 6
B.S. BOX	VS.7478	VS.7480	VS.7937	£1 . 12 . 0 £1 . 18 . 0 £2 . 17 . 6
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OUTSIDE CORNER	VS.7402	VS.7438	VS.7939	£1 . 18 . 0 £2 . 4 . 0 £3 . 5 . 0
INSIDE CORNER	VS.7403	VS.7439	VS.7940	£1 . 18 . 0 £2 . 4 . 0 £3 . 5 . 0
TILTED	VS.7404	VS.7469	VS.7941	£1 . 18 . 0 £2 . 4 . 0 £3 . 5 . 0

NOTE: *(a) Entry 1—¾" E.T. except for B.S. Box.* *(b) Finish Silvergloss. If galvanised is required the price is increased by 4/- for the 60/100 watt fitting and by 5/- for the 150 watt fitting. The suffix "G" should be added to the catalogue number.*

(c) If a guard is required for the 150 watt fitting the price is increased by 7/8 and the catalogue number VS.7942 should be quoted.

(d) Spares can be obtained and various lampholders fitted to suit customers requirements.

(e) The glass is not under pressure being cemented into the hinged ring, i.e. it is independent of the "Kautex" weatherproof gasket.

DIMENSIONS: *60/100 watt unit: 7 ins. wide x 10 ins. long x 5 ins. deep. 150 watt unit: 8½ ins. wide x 12 ins. long x 5½ ins. deep.*

There are countless uses for a robust fitting which will give light without glare in situations where the mounting height is limited, the area confined and where dampness, dirt and grime demand weatherproof construction. For example, good lighting is essential for safe working conditions in and out of doors, in ships' holds, engine rooms, underground chambers, corridors and stairways, conveyor runs, platforms on large plants, and in refrigeration stores.

We shall be glad to send you further information

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6. Multi-way Domed Glass Luminous Indicator.

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HYDE FOOT-OPERATED WIRE STRIPPER

Strips a wide range of insulated wires and small flexible cables up to ¼" outside diameter. Operating in one quick, effortless action, the stripper will not nick or damage wires.

HYDE E-Z WIRE STRIPPER

Used by hundreds of manufacturers, contractors and service agents. Precision stripping with the E-Z saves Wasting wire, prevents nicking and protects the user's fingers.

Stripping without teasing

HYDE BENCH-TYPE CABLE STRIPPER

Strips insulation from cables up to ¾" outside diameter, no splaying, no nicking, and one single movement does the whole job quickly and cleanly.

The days of clumsy stripping with knife or pliers have gone—the efficient, modern method is to use HYDE wire and cable strippers. Adjustable stops control length of strip. For greater production and perfect results without skill or experience, HYDE strippers are essential.

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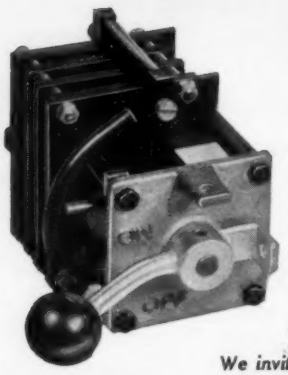

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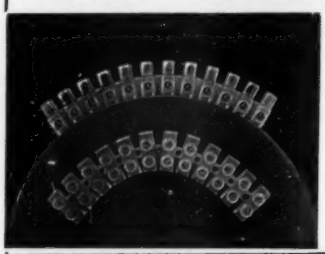

List prices per strip:—

5/10 amp.	4/4d.
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INSULATED COVER
With or without Pilot Light

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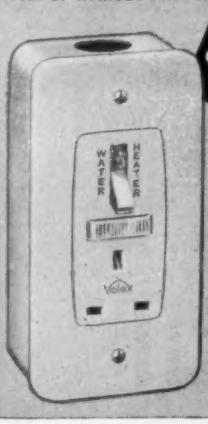
Available from your usual wholesale suppliers.



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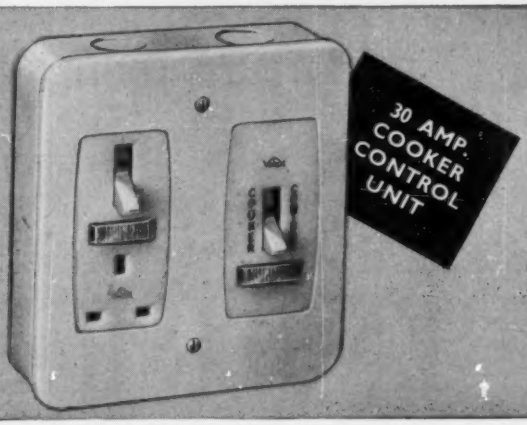
With 13 amp. 3 pin Sub-circuit.
With or without Pilot Light.



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SALFORD 6

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ACTUAL SIZE

Z2 SERIES ZENER DIODES

±5% Voltage Tolerance (Red and Green Sleeves)		±10% Voltage Tolerance (Red and Yellow Sleeves)		±20% Voltage Tolerance (Red and Blue Sleeves)	
TYPE	NOM. VOLTAGE	TYPE	NOM. VOLTAGE	TYPE	NOM. VOLTAGE
Z2A33	3.3	Z2A33	3.3		
Z2A36	3.6			Z2A33	3.3
Z2A39	3.9	Z2A39	3.9		
Z2A43	4.3				
Z2A47	4.7	Z2A47	4.7	Z2A47	4.7
Z2A51	5.1				
Z2A56	5.6	Z2A56	5.6		
Z2A62	6.2				
Z2A68	6.8	Z2A68	6.8	Z2A68	6.8
Z2A75	7.5				
Z2A82	8.2	Z2A82	8.2		
Z2A91	9.1			Z2A100	10
Z2A100	10	Z2A100	10		
Z2A110	11				
Z2A120	12	Z2A120	12	Z2A150	15
Z2A130	13				
Z2A150	15	Z2A150	15		

Characteristics and ratings of *SenTerCel* Zener Diodes are given in publication SIL/103A

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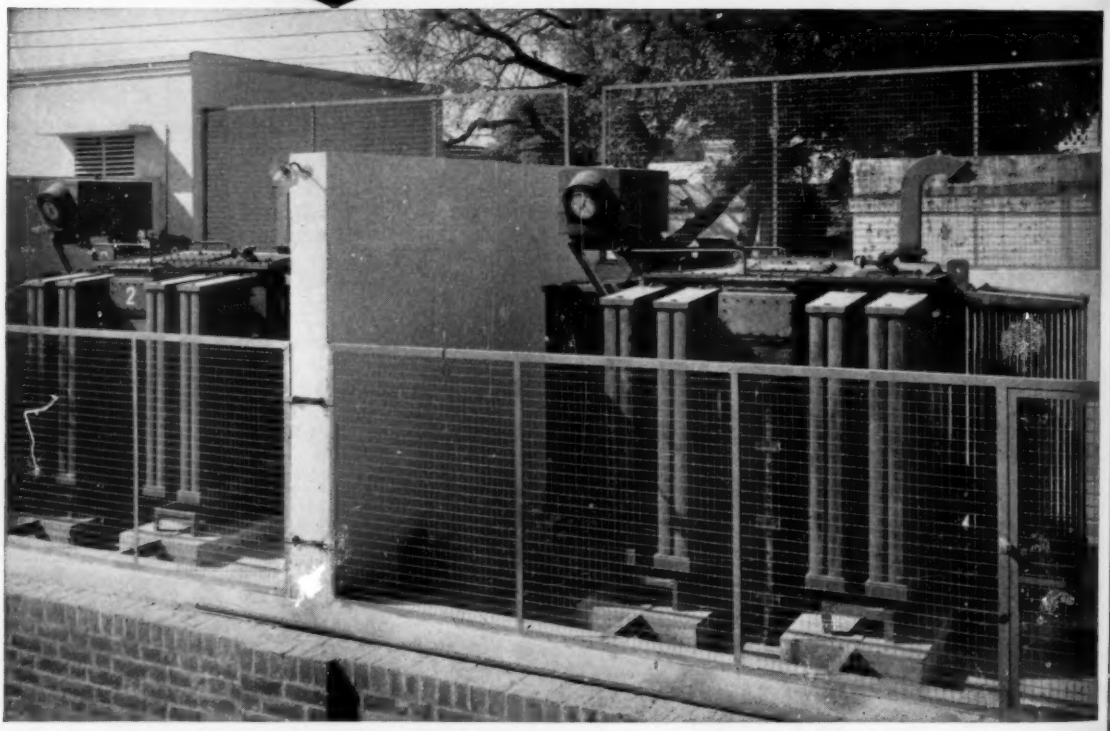


YORKSHIRE

ELECTRIC TRANSFORMER CO. LTD.
THORNHILL, DEWSBURY, YORKS

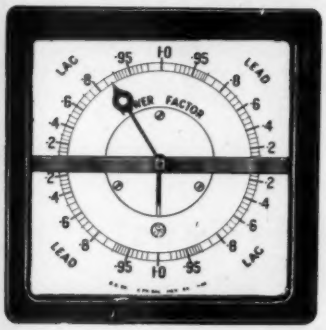
Telephone: DEWSBURY 1691-2

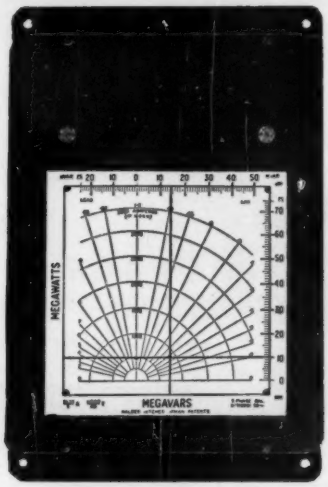
NALDERS

N C S

FOR HIGH QUALITY AND ACCURACY

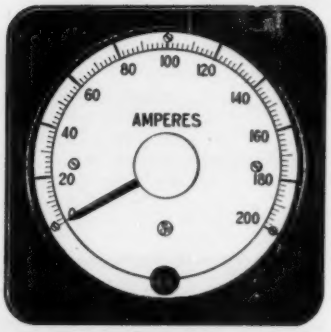
INSTRUMENTS





N.C.S. VECTORMETER

The *only* instrument to give simultaneous readings of Megawatts, Megavars, Amperes and Power Factor of the three-phase system in which it is connected. It shows also whether Power is being "Exported" or "Imported." Indication is by two points moving at right angles and in straight lines over a common dial. The Megawatt, Megavar and Ampere scales are each 6 ins. long.



Nalders manufacture a wide range of Electrical Measuring Instruments — indicating, recording, switchboard, portable — high quality being characteristic of every type. All instruments conform to B.S.S.89, cases being of Rectangular, Square, or Round pattern in diecast aluminium or pressed steel, finished bright black stove enamel or other colour to customers' requirements.

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BMJ

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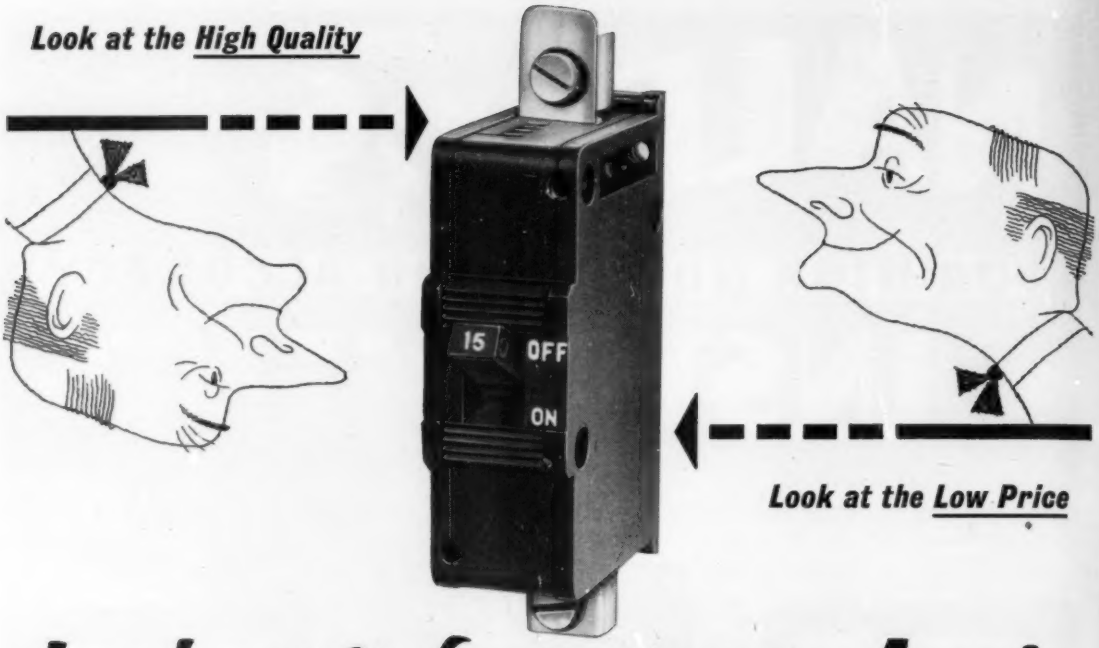

Look at the Low Price

Look at it from every Angle

DORMAN

LOADMASTER is Tops!

The DORMAN LOADMASTER Miniature Circuit Breaker offers outstanding advantages in *quality*, *performance* and *price*. Take a look at the performance figures, that's the right angle to start with. Examine it from a quality angle and see what a high degree of compactness and durability has been achieved. Lastly, the angle which many of us feel acutely, that of price, **single pole units only 18/8d. each, double pole units 60/- each** and **triple pole units 98/- each** list.

Units available in ratings of 5, 10, 15, 30, and 50 amps.
S.P. & N Distribution Boards up to 16 way,
T.P. & N Boards up to 12 way.
Domestic units up to 10 way.

SINGLE POLE UNITS

18/8 LIST

NEW ADDRESS OF HEAD OFFICE AND WORKS FROM AUGUST 3rd, 1958

ATHERTON WORKS
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Please send latest Miniature Circuit Breaker Catalogue

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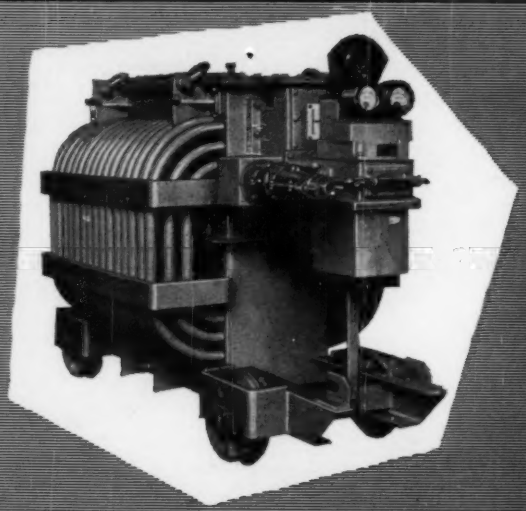

it's reliable and efficient service by

HACKBRIDGE TRANSFORMERS

★ Equipments illustrated are: A typical Hackbridge distribution transformer, 1,000 kVA three phase 11,000/460 volts, and Hackbridge mobile self-contained mine substation unit comprising a 300 kVA three phase 3,000/550 volt transformer, H.V. and L.V. switchgear and protective equipment.

HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
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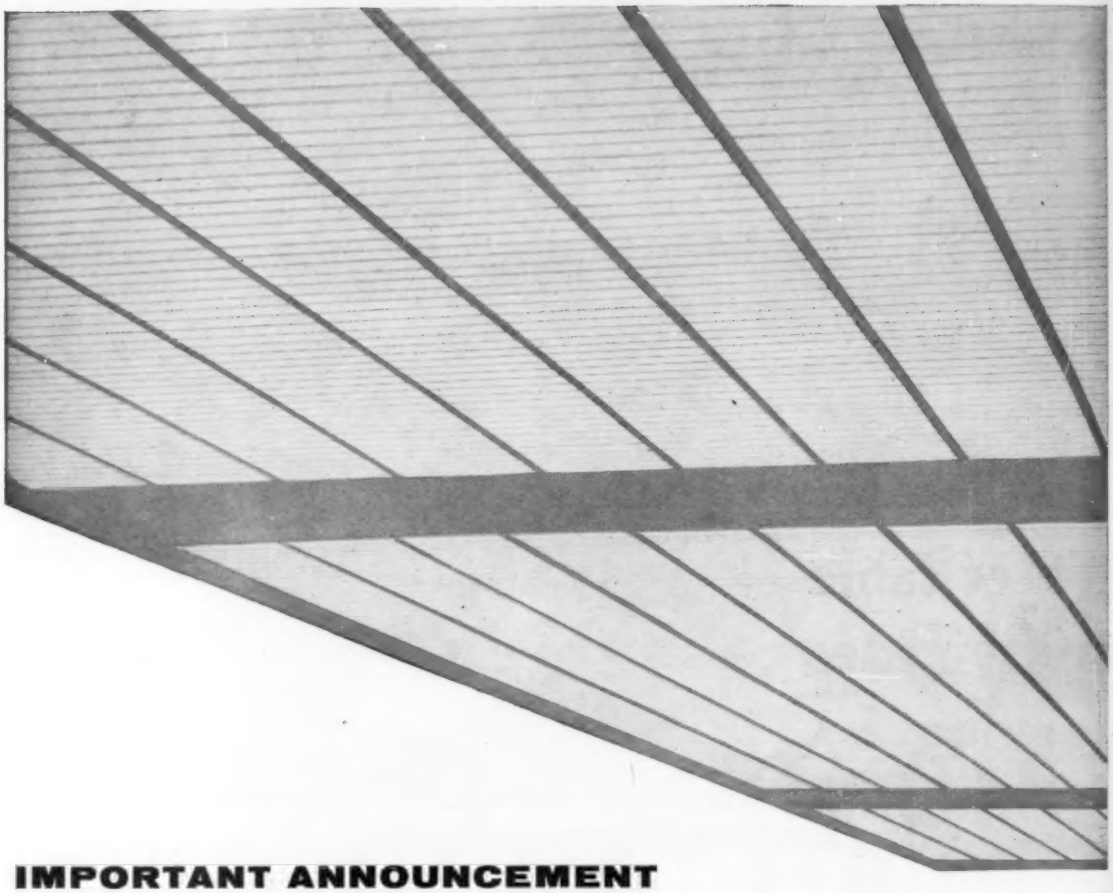
Telephone: Walton-on-Thames 760 (8 lines) *Telegrams: "Electric, Walton-on-Thames"*

T.10.

OVERSEAS REPRESENTATIVES.—**ARGENTINA** H. A. Roberts & Cia., S.R.L., Buenos Aires. **AUSTRALIA** Hackbridge and Hewittic Electric Co. Ltd., 171 Fitzroy Street, St. Kilda, Victoria; N.S.W., Queensland, W. Australia: Elder, Smith & Co. Ltd.; South Australia: Parsons & Robertson Ltd.; Tasmania: H. M. Bamford & Sons (Pty.) Ltd., Hobart. **BELGIUM AND LUXEMBOURG** Pierre Pollie, Brussels 3. **BRAZIL** Oscar G. Mors, Sao Paulo. **BURMA** Neonlite Manufacturing & Trading Co. Ltd., Rangoon. **CANADA** Hackbridge and Hewittic Electric Co. of Canada Ltd., Montreal: The Northern Electric Co. Ltd., Montreal, etc. **CEYLON** Envoe Ess Ltd., Colombo. **CHILE** Sociedad Importadora del Pacifico Ltda., Santiago. **EAST AFRICA** Gerald Hoe (Lighting) Ltd., Nairobi. **EGYPT** Giacomo Cohenca Fils, S.A.E., Cairo. **FINLAND** Sähkö-ja Koneliike O.Y. Hermes, Helsinki. **GHANA, NIGERIA & SIERRA LEONE** Glyndova Ltd. **GREECE** Charilaos C. Coroneos, Athens. **INDIA** Steam & Mining Equipment (India) Private Ltd., Calcutta; Essun Engineering Co. Ltd., Madras 1. **IRAQ** J. P. Bahoshy Bros., Baghdad. **MALAYA, SINGAPORE & BORNEO** Harper, Gilfillan & Co. Ltd., Kuala Lumpur. **NETHERLANDS** J. Kater E.I., Ouderkerk a.d. Amstel. **NEW ZEALAND** Richardson, McCabe & Co. Ltd., Wellington, etc. **PAKISTAN** The Karachi Radio Co., Karachi 3. **SOUTH AFRICA** Arthur Trevor Williams (Pty.) Ltd., Johannesburg, etc. **CENTRAL AFRICAN FEDERATION** Arthur Trevor Williams (Pty.) Ltd., Salisbury. **THAILAND** Vichien Phanich Co. Ltd., Bangkok. **TRINIDAD & TOBAGO** Thomas Peake & Co., Port of Spain. **TURKEY** Dr. H. Salim öker, Ankara. **U.S.A.** Hackbridge and Hewittic Electric Co. Ltd., P.O. Box 234, Pittsburgh 30, Pennsylvania. **VENEZUELA** Oficina de Ingenieria Sociedad Anonima, Caracas.

H



IMPORTANT ANNOUNCEMENT

The General Electric Co. Ltd.

and

Lumenated Ceilings Limited

The success of the Lumenated Ceiling technique with its evenly-diffused and shadowless lighting is well-known. A combined nation-wide service to market and apply this modern system has now been established by The General Electric Co. Ltd. and Lumenated Ceilings Ltd. The joint research and production facilities thus provided will extend still further the scope of this brilliant new idea in architectural lighting.

G.E.C.

THE GENERAL ELECTRIC CO. LTD.
Magnet House, Kingsway, W.C.2. Telephone: TEMple Bar 8000

LUMENATED CEILINGS LIMITED
Alliance House, Caxton Street, S.W.1. Telephone: ABBey 7113

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 2/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

ADVERTISEMENTS are accepted up to **First Post on Monday** of the week of issue and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

Original testimonials should not be sent with applications for employment

8th AUGUST ISSUE

Classified Advertisements for the above issue are accepted up to FIRST POST on FRIDAY, 1st AUGUST

OFFICIAL NOTICES, TENDERS, ETC.

BOROUGH OF WORKSOP

Street Lighting

TENDERS are invited from bona fide contractors for the removal of existing street lighting standards and for the supply, erection and servicing of the undermentioned street lighting units :—

13 fluorescent type lanterns, 3 × 80 watt, mounted on 25′ steel columns.
16 fluorescent type lanterns, 2 × 40 watt, mounted on 12′ 6″ cast iron columns.
20 sodium lanterns, 140 watt, mounted on 25′ steel columns.

Tenderers may quote for :—

1. Supply only the lanterns, auxiliary equipment and lamps; or
2. The removal of existing lighting units and the supply of new standards, together with the wiring and fitting of all equipment; or
3. The whole of the work required.

Copies of the specifications, bills of quantities and forms of tender may be obtained from the Borough Engineer, Park House, Worksop, upon payment of a deposit of £3 3s., which will be reimbursed upon the receipt of a bona fide tender and the return of all documents supplied.

Tenders in sealed envelopes, endorsed "Street Lighting," must reach the undersigned not later than noon on Monday, the 11th August, 1958.

The lowest or any tender will not necessarily be accepted.

W. A. WILLIAMS,
Town Clerk.

Town Hall,
Worksop, Notts. 4259

MADRAS PORT TRUST, MADRAS, INDIA

THE Office of the Chief Engineer invites tenders for the following :—

Tender Enquiry No. 16/EP3/1687/58 for the supply of 4 300-kVA Transformers.

Specifications, drawings, etc., relative to the above can be obtained direct from the Deputy Chief Accounts Officer (Engineering), Chief Engineer's Office, Madras Port Trust, Madras, India, on payment of 15 shillings, which is not refundable. Tenders are to be returned direct to the Madras Port Trust of the above address so as to reach them by 3 p.m. on 8th September, 1958.

Specimen copy of the above specification can be seen at India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, under reference S.3435/58/AVH/ENG.2. 4258

MADRAS PORT TRUST, MADRAS, INDIA

THE Office of the Chief Engineer invites tenders for the following :—

Tender Enquiry No. 16/EP3/1571/58 for the supply of H.T. CABLES.

Specifications, drawings, etc., relative to the above can be obtained direct from the Deputy Chief Accounts Officer (Engineering), Chief Engineer's Office, Madras Port Trust, Madras, India, on payment of 4 shillings and sixpence which is not refundable. Tenders are to be returned direct to the Madras Port Trust of the above address so as to reach them by 3 p.m. on 2nd September, 1958.

Specimen copy of the above specification can be seen at India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, under reference S.3420/58/AVH/ENG.2. 4234

DAMODAR VALLEY CORPORATION

THE Office of the Damodar Valley Corporation, Anderson House, Alipore, Calcutta, 27, India, invites tenders for the following :—

D.V.C. Tender Enquiry No. PE-SPEC. 53 for the supply of Motor Lockout Switches for 3-kV and 400-volt Motors for D.V.C. Durgapur Thermal Power Station and Bokaro Fourth Unit.

Specifications, drawings, etc., relative to the above, can be purchased direct from Damodar Valley Corporation of the above address at 4s. 6d. per copy plus £1 17s. 6d. for air parcel charges. Tenders are to be returned direct to Damodar Valley Corporation, Anderson House, Alipore, Calcutta, 27, India, to reach them by 3 p.m. on 21st August, 1958.

Specimen copy of the above specification is on view at India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, under reference S.3432/58/AVH/ENG.2.

COUNTY BOROUGH OF CROYDON

Street Lighting

TENDERS are invited for supplying and installing 600 140-watt Sodium Standards.

Form of tender, conditions of contract and specification from the Borough Engineer, Town Hall, Croydon.

Tenders in plain envelopes endorsed "Street Lighting Standards," must reach me by 11th August, 1958.

E. TABERNER,
Town Clerk.
4246

STOCKPORT CORPORATION TENDERS

TENDERS (fixed price) invited for Electric Lighting and Power Installation. First Floor, Town Hall, Stockport. Documents available from Borough Architect, Town Hall. Tenders due 8th September, 1958. 4297

SITUATIONS VACANT

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

APPLICATIONS are invited for the following positions:—

ASSISTANT SHIFT CHARGE ENGINEER, Barley Generating Station, Reading (S/13.1019).

Applicants should have had previous experience in a large modern generating station, and preference will be given to those with experience of high operating temperatures and pressures, and pulverised fuel equipment. Manufacturing works experience will be an advantage.

Preference will be given to those who possess qualifications leading to corporate membership of a recognised professional institution, or those holding appropriate equivalent qualifications.

Salary N.J.B. Grade G.9 £835-£880.

GENERAL ASSISTANT ENGINEER, Non-Destructive Testing Section, Generation Operation Department, Portsmouth (S/13.1012).

Applicants should have had workshop experience and a knowledge of electronics would be an advantage. There will be opportunities for training in non-destructive testing techniques and methods.

Salary N.J.B. Grade 9 AX/DX, £550-£685.

Special application forms, obtainable only from P. D. A. Oliver, Divisional Secretary, 111, High Street, Portsmouth, should be returned by 7th August, 1958. 4283

SOUTHERN ELECTRICITY BOARD

Assistant Engineer (Maintenance and Operation)

Isle of Wight District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class F, Grade 10 (£740 × £15 to £785 per annum). N.J.B. conditions of service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution, mains and substations, and with minor construction work. The possession of suitable technical qualifications will be an advantage. The appointment will involve standby duties.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed, quoting Z.823, not later than 6th August, 1958.

Assistant Engineer (Local)

Yeovil District of No. 4 (Bournemouth) Sub-Area, located at the Frome Branch. Salary N.J.B. Class F, Grade 10 (£740 × £15 to £785 per annum). N.J.B. conditions of service.

Applicants should have had experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems. The possession of suitable technical qualifications would be an advantage. The successful candidate will be required to carry out standby duties if and when called upon to do so.

Applications on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, and returned to him in envelopes suitably endorsed, quoting Z.928, not later than 6th August, 1958.

General Assistant Engineer

Sub-Area Engineering Department (Meter Section) of No. 1 (Southall) Sub-Area, located at Waterloo Road, Uxbridge, Middlesex. Salary N.J.B. Class I, Grade 16 (£725-770 per annum, inclusive of London allowance). N.J.B. conditions of service.

Applicants should have experience in three-phase meter testing, instrument transformer testing, assisting in the standardising of watt-meters and the commissioning of special equipment.

Applications on forms obtainable from the Sub-Area Secretary, 2/6, Windmill Lane, Southall, Middlesex, and returned to him in envelopes suitably endorsed, quoting Z.902, not later than 6th August, 1958.

Assistant Engineer (Maintenance and Operation)

Salisbury District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class E, Grade 11 (£635 × £15 to £680 per annum). N.J.B. conditions of service.

Applicants should have had experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems. The possession of suitable technical qualifications would be an advantage. The successful candidate will be required to carry out standby duties if and when called upon to do so.

Applications on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, and returned to him in envelopes suitably endorsed, quoting Z.930, not later than 6th August, 1958.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. 4273

***Situations Vacant** (continued)*

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts :—

Birmingham and District Sub-Area

FOURTH ASSISTANT ENGINEER (Technical and Planning Section) (Headquarters).

The successful applicant will be required to assist in the design of the H.V. and M.V. systems, analysis of loading conditions, preparation of specifications and the layout of plant and equipment. Technical qualifications desirable. Salary £885/£930 per annum (N.J.B. Grade M.13).

Apply by letter, within 14 days, stating age, education, experience, present position and salary to Emil Braathen, Sub-Area Manager, Midlands Electricity Board, 14, Dale End, Birmingham, 4.

Central Gloucestershire Sub-Area

DISTRICT ENGINEER (Cheltenham District).

Applicants must have had a sound technical training and extensive experience in the construction, operation and maintenance of high-voltage and low-voltage distribution networks, and associated switchgear, transformers and protective systems. Appropriate technical qualifications essential. Salary £1,160/£1,235 per annum (N.J.B. Grade F.3).

SECOND ASSISTANT DISTRICT ENGINEER (Dean Forest District).

Experience necessary in all branches of distribution work, including construction, maintenance and operation of high and low voltage systems and substations, and the planning of system reinforcements and mains extensions. Technical qualifications desirable. Salary £835/£880 per annum (N.J.B. Grade E.7).

THIRD ASSISTANT DISTRICT ENGINEER (Cheltenham District).

Experience necessary in all branches of distribution work, including operation and maintenance of high and low voltage underground and overhead distribution systems. Technical qualifications desirable. Salary £790/£835 per annum (N.J.B. Grade F.9).

Apply by letter, within 14 days, stating age, experience, present position and salary to Mr. S. Raybould, Sub-Area Manager, Midlands Electricity Board, 126, London Road, Gloucester.

Wolverhampton and District Sub-Area

GENERAL ASSISTANT DISTRICT ENGINEER (Wolverhampton District).

Applicants should have had a sound technical training and experience in the construction, maintenance and operation of overhead and underground systems and substations. Technical qualifications desirable. Salary £635/£680, £685/£730 or £740/£785 per annum (N.J.B. Grades H.14, H.13 or H.12), according to qualifications and experience.

Apply by letter, within 14 days, stating age, qualifications, experience, present position and salary to Mr. D. Holt, Sub-Area Manager, Midlands Electricity Board, 83, Darlington Street, Wolverhampton.

A. STEPHENS,
Secretary. 4284

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

York Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER, Scarborough.

Salary Schedule A, Class E, Grade 7, £835/£880. N.J.B. conditions of service.

SECOND ASSISTANT DISTRICT ENGINEER, Malton.

Salary Schedule A, Class D, Grade 7, £790/£835. N.J.B. conditions of service.

Applicants for above vacancies should preferably have had experience on networks supplying urban and rural areas and in the supervision of direct labour and contractors on construction work.

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER, Scarborough.

Salary Schedule A, Class E, Grade 5, £935/£995. N.J.B. conditions of service.

Applications, stating age, qualifications and experience, to be received by the Assistant Secretary (Establishments), the North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 4291

ATOMIC ENERGY RESEARCH ESTABLISHMENT

Harwell

A WIDELY experienced and professionally qualified ENGINEER is required to design a wide range of mechanical, electrical and heating and ventilating services (including external distribution systems) for radioactive and conventional laboratories and other buildings, to prepare cost estimates and specifications and to supervise a team of draughtsmen.

SALARY: £1,300-£1,740 (Engineer II).

Send POST CARD to the Group Recruitment Officer (1165/48), A.E.R.E., Didcot, Berks, for application form and details. 4275

SOUTH WALES SWITCHGEAR LTD.

Blackwood, Mon.

WE invite applications from capable young men possessing drive and initiative for the following positions in our rapidly expanding organisation. Candidates should preferably possess a Higher National Certificate or equivalent qualification but good experience in one or more of the following fields is considered to be of prime importance.

DESIGN DRAUGHTSMEN.
Experienced in the design of H.V. switchgear and associated equipment.

CONTRACTS DRAUGHTSMEN.
With experience in the application and layout of switchgear in one or more of the following fields:—
Outdoor and Indoor Substations.
Power Station and Industrial Switchgear.
Generator Busbar Trunking.

DIAGRAMS DRAUGHTSMEN.
Experienced in the layout and detail of protective and control systems, etc., covering all types of switchgear applications.

The vacancies occur in a modern factory located in pleasant surroundings within easy access of Cardiff and Newport.

Applications, which will be treated in the strictest confidence, should be addressed to the Chief Draughtsman.

4064

PYE LIMITED

have vacancies in the Cambridge area for senior and junior

MECHANICAL and ELECTRICAL DRAUGHTSMEN

for an expanding programme in their design departments.

Applicants should have sound engineering training, and practical experience in the fields of
Instrumentation,
Mechanical Handling, Hydraulics or Pneumatics
could be an advantage.

Please write giving brief details of qualifications and experience and quoting "DSA" to

Chief Engineer
PYE LIMITED
Cambridge.

4276

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following appointments in this Division:—

SECOND ASSISTANT ENGINEER (Mechanical), Generation (Construction) Department, Spondon H Power Station Site (Vacancy No. 112/58.ER.).

Applicants should have had a fundamental training in mechanical engineering including workshops, together with experience in the manufacture and erection of heavy mechanical plant as installed in a modern power station. It would be an advantage for candidates to have a University degree or equivalent qualification in mechanical engineering.

The salary will be in accordance with Schedule B, Class AX/EX, Grade 4 (£1,145-£1,410 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications 7th August, 1958.

SHIFT CHARGE ENGINEERS, Drakelow B Power Station (Vacancy No. 113/58.ER).

Candidates should have had a sound technical training and considerable experience in a large modern power station. Preference will be given to candidates who possess qualifications admitting to Corporate Membership of the Institution of Electrical and/or Mechanical Engineers, and a knowledge of pulverised fuel firing will be an advantage. The ultimate capacity of the station will be 480 MW.

Salary will be in accordance with Class J, Grade 6 (£1,160-£1,235 per annum) of the National Joint Board Agreement plus 10% allowance for shift duties.

Closing date for receipt of applications 7th August, 1958.

These appointments will be pensionable under the terms of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE.6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. PLEASE QUOTE VACANCY NUMBER.

DIVISIONAL CONTROLLER.
18th July, 1958. 4278

YORKSHIRE ELECTRICITY BOARD

No. 5 (Wakefield) Sub-Area

SERVICE CENTRE SUPERVISORS.

Applicants must be thoroughly experienced in service centre work including the sale of electrical appliances, hire purchase procedure, handling of consumer enquiries, display, and must be capable of advising consumers on any matters relating to electricity in the home. The successful applicants will be responsible for the internal organisation of the service centre and the control of staff. Suitable qualifications will be an advantage.

1 Post, Wood Street, Wakefield.
1 Post, Eldon Street, Barnsley.

Salary N.J.C. Grade 4, £765/£25/£840 per annum.

CASTLEFORD DISTRICT
SERVICE CENTRE SUPERVISOR, Castleford.

Applicants must be thoroughly experienced in service centre work including the sale of electrical appliances, hire purchase procedure, handling of consumer enquiries, display, and must be capable of advising consumers on any matters relating to electricity in the home. The successful applicant will be responsible for the internal organisation of the service centre and the control of staff including a demonstrator, trainee demonstrator, sales representative and trainee service centre assistant. Suitable qualifications will be an advantage.

Salary N.J.C. Grade 5, £855/£25/£930 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 12, Denby Dale Road, Wakefield, not later than 8th August, 1958.

4274

COLLEGE OF TECHNOLOGY BIRMINGHAM

(Designated College of Advanced Technology)
Principal: P. F. R. Venables, Ph.D., B.Sc., F.R.I.C.

Research Fellowships

AS part of the expansion of the work of the College since its designation as a College of Advanced Technology, the Governors have established Research Fellowships in the following departments:—

CHEMISTRY.
METALLURGY.
ELECTRICAL ENGINEERING.
PHYSICS.
INDUSTRIAL ADMINISTRATION.

Candidates must either have shown exceptional promise in research in science or technology, or in industrial experience relevant to the proposed subject for research. They should possess a good first degree, and a higher degree gained as the result of research work; or possess a college associateship or diploma in technology or appropriate professional qualification followed by exceptionally valuable and interesting industrial experience, or appropriate research work in industry, research associations or government establishments. Candidates should submit their own research proposals for consideration.

The salary scale is equivalent to that laid down by the Burnham Technical Report for Grade B teachers, i.e. £650 × £25 to £1,025, plus graduate and training allowances. Further details can be given on the basis of the applicant's biographical data. However, as an indication it may be noted that an applicant with a good honours degree, or a Ph.D., gained as the result of five years' approved full-time study, would have a starting salary of £850.

The appointment, normally tenable for three but not more than four years, will be made as from 1st September, 1958, or as soon as possible thereafter.

Further particulars and forms of application from the Registrar, College of Technology, Gosta Green, Birmingham, 4, on receipt of stamped addressed foolscap envelope. Applications to be received within 18 days of this advertisement. Please quote "G."

K. R. PILLING,
Clerk to the Governing Body.

4252

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

APPLICATIONS are invited for the following positions in the System Development Section of the Technical Department at Headquarters, Moseley, Birmingham.

(a) THIRD ASSISTANT ENGINEER (Vacancy Number 838MD). N.J.B. service conditions, superannuable appointment, salary within Schedule B, Grade 6, commencing at a point commensurate with qualifications and experience within the range £895-£1,020 per annum ultimately rising to £1,140.

(b) FOURTH ASSISTANT ENGINEER (Vacancy Number 839MD). N.J.B. service conditions, superannuable appointment, salary within Schedule B, Grade 8, commencing at a point commensurate with qualifications and experience within the range £710-£835 per annum ultimately rising to £935.

Applicants for (a) should possess qualifications equivalent to Graduate I.E.E. and should have had practical training either in the supply industry or with a switchgear manufacturer. They should also have held a position involving transmission system planning and should have a sound knowledge of the calculations involved and of the design and operation of such systems. Applicants for (b) should have had experience either in the supply industry or with a switchgear manufacturer and a knowledge of the calculations involved in the development and operation of power systems will be an advantage. Technical qualifications up to Graduate I.E.E. standard are desirable.

Apply, quoting the respective vacancy number on form AE6, to the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 14th August, 1958. 4237

M.K. ELECTRIC LIMITED

require an
EXPERIENCED SALES REPRESENTATIVE
for
NORTH-WEST OF ENGLAND

THE successful candidate will be required to live near Manchester. If you have experience in calling on architects, electrical wholesalers and contractors, are a car owner, and would like to join the sales team of a progressive company marketing products with a world-wide reputation, we would like to hear from you in confidence. Write in the fullest detail to:—

The Sales Manager, M.K. Electric Ltd.
Wakefield Street, London, N.18.

4154

FORMICA LIMITED

THREE vacancies exist in the Industrial Sales Division of Formica Limited, a subsidiary of Thomas De La Rue & Co. Ltd., for

SALES REPRESENTATIVES.

Candidates should be between 25 to 35 years of age, and have several years' successful industrial selling experience. Preference will be given to candidates with live contacts in, and a sound background knowledge of, the electrical engineering industry. Successful candidates must be prepared to work anywhere in the U.K., and will initially be attached to the company's factory at Tynemouth, where they will be given comprehensive training in the production, properties and uses of industrial Formica.

Salary will depend on qualifications and experience. There is an excellent contributory superannuation scheme. After the training period a car will be provided and expenses paid by the company.

The vacancies provide an excellent opportunity for men of initiative, personality and drive, who are keen to progress in a rapidly expanding company marketing a product of international fame.

Applications containing full particulars of past experience, etc., to

Chief Personnel Officer
FORMICA LIMITED
84, Regent Street, London, W.1

4282

ELECTRICAL DESIGN AND DEVELOPMENT

EXPANSION of this work provides opportunity for men technically qualified to H.N.C. standard or above. Our immediate requirement is for:—

DESIGN ENGINEERS to work on specialised A.C. and D.C. rotating machines; those with design/layout experience on machines up to 200 kW are particularly eligible.

We shall have other interesting appointments to make in the near future and if you believe you could qualify for a place in our specialist design team please make application now.

Our policy is to reward real ability within all reasonable limits and we can offer appointments of absorbing interest.

Replies, including age and salary indication, will be treated most confidentially if addressed to:—

Chief Electrical Designer
VERNONS INDUSTRIES LTD.
Kirkby Industrial Estate
Liverpool

4228

FEDERAL POWER BOARD OF RHODESIA AND NYASALAND

APPLICATIONS are invited for the following appointments:—

TRANSMISSION ENGINEER.
Salary £2,500 p.a.

PROTECTION AND TELECOMMUNICATIONS ENGINEER.
Salary £2,250 p.a.

ASSISTANT ELECTRICAL CONSTRUCTION ENGINEER. Salary £1,750 p.a.

The board is at present constructing at the Kariba Gorge on the Zambesi a large dam and power station having an initial capacity of 600 MW and an ultimate capacity of, at least, 1,200 MW. It is also constructing about 930 miles of 330 kV transmission line to connect the Kariba power station with a number of thermal stations in the Federation.

Applicants for the post of transmission engineer should be fully qualified transmission engineers. Duties will be connected with the design, construction and maintenance of high voltage transmission lines and some aspects of maintenance in the Board's substations.

For the post of protection and telecommunications engineer applicants should be fully qualified and have a good knowledge of plant and transmission system protection. Duties will be connected with the installation and operation of protective gear in the Board's power station and substations and will involve other light electrical equipment including metering, telephone, telegraph, voice frequency and carrier communication equipment.

Applicants for post of assistant electrical construction engineer should be qualified engineers or graduates with experience in an engineering works or in the power supply industry. Duties will be to assist the Board's electrical construction engineer with the designing, construction and installation of electrical and mechanical plant.

All posts are subject to the Board's service and leave rules and successful applicants will be required to join the Board's pension fund.

Applications should be posted so as to reach the Secretary, Federal Power Board, P.O. Box 630, Salisbury, Southern Rhodesia, not later than 1st September, 1958. 4133

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following posts:—

SHIFT CHARGE ENGINEER,
Brimsdown "A" Generating Station
(Vacancy No. 1051).

Salary Class F, Grade 7, £885 × £15 to £930 per annum, plus £50 per annum London weighting, plus 10% shift allowance.

Applicants should have served an apprenticeship and obtained an Ordinary National Certificate in Mechanical and/or Electrical Engineering, or equivalent. Experience in the operation of generating station plant at high steam pressure is essential.

GENERAL ASSISTANT ENGINEERS,
Rye House Generating Station
(Vacancy No. 1052).

Salary Class G, Grade 14, £590 × £15 to £635 per annum or Grade 15, £540 × £15 to £585 per annum, plus 10% shift allowance when employed on shift duties.

Duties include assisting in the electrical control room and experience in the technical operation of electrical, boiler house, and turbine house plant, testing, etc., in a generating station and provide a suitable basis for promotion to higher technical grades.

Manual workers in skilled grades with suitable technical training will be considered. Previous experience in a generating station and/or technical training to the standard of the Ordinary National Certificate or its equivalent will be an advantage.

Applications, quoting vacancy number and reference 2/9438, stating age, qualifications and experience should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., by 2nd August, 1958.

W. N. C. CLINCH,
Controller.

4253

Situations Vacant (continued)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Kincardine Generating Station

APPLICATIONS are invited for the following superannuable appointments :—

(1) ASSISTANT SHIFT CHARGE ENGINEERS (Ref. K9).

Applicants should have experience of operation of modern high-pressure turbine and boiler plant with pulverised fuel firing in a modern power station and have reached a technical education standard of Higher National Certificate or equivalent.

Salary N.J.B. Class K, Grade 9, £995/£1,055 rising, ultimately, to Class M, Grade 9, £1,160/£1,235 per annum, plus 10% shift allowance when engaged on shift duties.

(2) PLANT SHIFT CONTROL ENGINEERS (Ref. K10).

Applicants should have experience of station control room duties in a modern power station and possess qualifications of Higher National Certificate standard or equivalent. The duties will include operation and supervision of all control equipment associated with main plant.

Salary N.J.B. Class K, Grade 10, £935/£995 rising, ultimately, to Class M, Grade 10, £1,065/£1,140 per annum, plus 10% shift allowance when engaged on shift duties.

Arrangements are being made to provide housing accommodation, where necessary.

Applications, on the standard form and quoting appropriate reference number, should be submitted to the Secretary, South of Scotland Electricity Board, 168, Broomhill Drive, Glasgow, W.1, not later than 9th August, 1958. 4256

EAST MIDLANDS ELECTRICITY BOARD

General Assistant District Commercial Engineer

Boston District

Lincolnshire Sub-Area

APPLICATIONS are invited for the position of General Assistant District Commercial Engineer in the Boston District.

The successful applicant will be responsible for the operation of the Service Centre at Skegness together with sales promotion and consumer service in Skegness and district.

Applicants should have a sound knowledge of sales procedure, including hire purchase and credit sales transactions together with experience of preparing estimates for domestic and small commercial installations, and it would be an advantage if applicants have had some mains experience.

The successful applicant will be required to live in or near to Skegness and ability to drive a motor vehicle is essential.

The salary and conditions of the appointment will be in accordance with Class E, Grade 10, of the National Joint Board Agreement (£685 × £15 to £730 per annum).

Applications stating age, qualifications, education, experience and details of present position should be forwarded to the Manager, Boston District, Besco House, Boston, Lincs., so as to reach him within fourteen days of the issue of this advertisement. 4288

LIVERPOOL REGIONAL HOSPITAL BOARD

ASSISTANT ENGINEER (Electrical) required on the staff of the Regional Engineer.

Applicants should have passed the institution examination and be Graduate Members of the Institution of Electrical Engineers; be experienced in the preparation of specifications, drawings and estimates for distribution schemes, electrical installations in hospitals and buildings and be able to take details of existing installations and have a good knowledge of modern installation practice.

Salary scale £700-£1,015 per annum. Starting salary depending on age and previous relevant practical experience.

Applications stating age, qualifications, experience, present and previous appointments with names and addresses of three referees (two technical) to reach me at 55, Castle Street, Liverpool, 1, by 5th August, 1958.

VINCENT COLLINGE,
Secretary to the Board.
4176

CENTRAL ELECTRICITY GENERATING BOARD

Mechanical Engineer Research Laboratories

MECHANICAL ENGINEER required in the Mechanical Engineering Section of the Research Laboratories, Leatherhead, Surrey, to assist in research on the vibration and fatigue characteristics of steam turbine blading and heat exchanger tubing. The successful candidate will be required to design his own rigs and develop his own instrumentation. A man with both theoretical and practical engineering ability is required. Candidates should have a degree in engineering or equivalent and preferably some industrial experience. Salary within scales £820-£995 or £1,055-£1,265 p.a.

Applications stating age, qualifications, experience, present position and salary to S. S. Scott, Chief Personnel Officer, 24/30, Holborn, London, E.C.1, by 5th Aug. Envelopes should be marked "Confidential," quoting reference ER/208. 4254

CAMERA TUBE RESEARCH

APPLICATIONS are invited from men with a Ph.D. or good Honours Degree who would like to join a new research team working on television camera tubes and other photo-electronic devices. Experience in this field is not essential but candidates must have a sound basic knowledge of photoconductivity, solid state physics or physical chemistry. Practical experience in these fields, or in vacuum technology would be valuable.

Brief details in first instance to:—

Central Personnel Services

Marconi House

Strand, London, W.C.2

Please quote reference ER.1506P.

4251

ENGLISH ELECTRIC

A VACANCY has arisen in the Gas Turbine Division for an ELECTRICAL ENGINEER.

Applicants should have reached at least H.N.C. (Electrical) level and should have a good electrical engineering background together with some experience of rotating machinery.

Please write, giving details of education, qualifications and experience to :—

Department C.P.S.,

Marconi House

Strand, London, W.C.2

quoting reference ER.1909F.

4250

EAST MIDLANDS ELECTRICITY BOARD

Fourth Assistant District Commercial Engineer

Burton District

Derby and Burton Sub-Area

APPLICATIONS are invited for the post of Fourth Assistant District Commercial Engineer in the District Commercial Department at Burton-upon-Trent.

Applicants should have received a practical training in the electrical industry. A good knowledge of the Board's tariffs and the I.E.E. regulations is essential. Ability to drive a car would be an advantage.

The duties will include the supervision of all outside installation work, including the fixing and maintenance of consumers' apparatus, change-over of consumers' apparatus to standard voltage, and the maintenance of street lighting.

The salary and conditions of the appointment will be in accordance with the National Joint Board Agreement, Class F, Grade 11 (£685 × £15 to £730 per annum).

Applications stating age, qualifications and experience, previous and present appointments should be forwarded to the Manager, Derby and Burton Sub-Area, 36, Full Street, Derby, so as to reach him within fourteen days of the issue of this advertisement. 4289

WARWICKSHIRE EDUCATION COMMITTEE

Rugby College of Technology and Arts

THE Governing Body of the College invites applications for the post of LECTURER IN ELECTRICAL ENGINEERING in that portion of the college dealing with full-time industry-based sandwich courses only. This is a progressive post in a rapidly developing college with an expanding programme of advanced courses in engineering technology and an assured recruitment of industry-based students. Unusual opportunities exist for the promotion of industrial contacts and research activities.

Applicants should have a university degree and appropriate teaching and/or industrial experience, and should preferably have an interest in the subject of electrical machines.

Salary scale in accordance with the Burnham Technical Report for Lecturers, £1,200 × £30 to £1,350.

Further particulars and application forms may be obtained from the Principal, to whom replies should be addressed as soon as possible.

W. COOPER,
Principal.

Rugby College of Technology and Arts,
Eastlands,
Rugby. 4231

ELECTRICITY AUTHORITY OF CYPRUS

DEPUTY STATION SUPERINTENDENT required for two tours each of two years with prospects of permanency or in certain circumstances on temporary terms. Salary (including bonus and overseas and temporary allowances) £1,895 rising to £2,152 a year. Outfit and settling in allowances £35 (£75 if accompanied by wife). Children's educational grants in certain circumstances. Free passages and furnished quarters. Liberal leave on full salary. Superannuation scheme similar to C.E.G.B. scheme. Benefits under latter scheme may sometimes be preserved.

Candidates must be Corporate Members of the Institutions of Mechanical or Electrical Engineers or equivalent. They should have had extensive experience of public electricity undertakings with particular respect to the operation and maintenance of steam powered station plant and associated equipment including 66 kV substations.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/42691/EF. 4224

AREA SALES MANAGER

required by leading manufacturers of electrical control gear. Successful applicant will have sound technical and commercial background and a proven record of technical selling ability.

This is a senior appointment and a car is provided.

Apply to Regional Manager, Dewhurst & Partner Ltd., Suffolk House, Suffolk Street, Birmingham, giving full details of age, experience, salary required, etc. 4241

AIR MINISTRY

STATION ENGINEERS (G.D.) and STATION ENGINEERS (Mech.) required at R.A.F. and M.T.C.A. Stations. Qualifications required (a) O.N.C. Elec. or Mech. or equivalent; (b) recognised apprenticeship in electrical or mechanical engineering with firm or establishment of good repute; (c) 3 years' employment in electrical or mechanical engineering, preferably on operation and maintenance of mine, factory or workshops plant and services. Preference given to candidates with supervisory experience subsequent to (b) and (c).

Work consists of installation, operation and maintenance of high and medium voltage electrical distribution system electrical installation, generating plant, steam and hot water heating systems and miscellaneous works plants, tools and equipment.

Commencing salary according to age, qualifications and experience on range £655-£820. Appointments non-pensionable. Liability for tours of duty overseas for which special allowance payable in addition to higher salary.

Applications from natural-born British subjects only, up to age 40 years.

Write giving age, full details of qualifications and experience, quoting PE.3140-1, to Manager, Ministry of Labour and National Service, Professional and Executive Register, Atlantic House, Farringdon Street, London, E.C.4. Only candidates selected for interview will be advised.

375

SOUTH WESTERN ELECTRICITY BOARD

Bath District

THIRD ASSISTANT DISTRICT ENGINEER

APPLICATIONS are invited from suitably qualified and experienced persons for the above appointment.

Salary according to Class F, Grade 9 (£790 × £15 to £835 per annum) of Schedule A of the N.J.B. Agreement.

The successful candidate will be required to assist generally in the planning and technical work relating to, and the supervision of, construction and maintenance of substation equipment up to and including 33 kV, and also for both overhead and underground distribution systems.

The person appointed will be required to undertake standby duty and he will be appointed a Senior Authorised Person.

Possession of appropriate technical qualifications at least equal to the Higher National Certificate in Electrical Engineering is necessary, and a current driving licence is desirable.

Applications to be made on official form OBTAINABLE BY POSTCARD ONLY from District Manager, South Western Electricity Board, The Old Bridge, Bath. Closing date for receipt of completed applications is 9th August, 1958. 4293

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable appointment in the Technical Section of the Chief Engineer's Department at Kirkintilloch.

THIRD ASSISTANT ENGINEER
(Telecommunications)

Candidates should have a good general education and preferably have their Higher National Certificate or City and Guilds Final Certificate in telecommunications.

The duties will consist of commissioning and maintaining part of the Board's V.H.F. radio telephone system and investigation of problems in the telecommunications field with particular reference to the Board's V.H.F. radio, remote control and indicating systems. An extensive knowledge of telecommunications particularly radio and electronics is essential. Experience of supervisory control and telemetering systems would be considered an advantage.

Salary £895/£1,140 per annum in accordance with Class AX/EX, Grade 6 of Schedule B to the National Joint Board Agreement.

Apply quoting Reference No. E28/58 on standard form AE.6, available from the Secretary, P.O. Box 173, 351, Sauchiehall Street, Glasgow, C.2, not later than Friday, 15th August, 1958. 4277

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Division

Appointment of Assistant Engineer (Instruments)

Steam Testing Department
North Tees "C" Power Station

APPLICATIONS are invited for the appointment of Assistant Engineer (Instruments) in the Steam Testing Department with Headquarters at North Tees "C" Power Station.

The successful applicant will be required to assist in the maintenance of all types of instruments and automatic control equipment associated with boilers and turbines in a modern power station.

Applicants should preferably possess a Higher National Certificate or equivalent qualifications.

The salary for the appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule A, Grade 12, Class J (£790-£835 per annum).

Forms of application may be obtained from Divisional Establishments Officer, Central Electricity Generating Board, North Eastern Division, Carliol House, Newcastle upon Tyne, 1, to whom they should be returned to arrive not later than 11th August, 1958. 4290

UCAN DEVELOPMENT LIMITED

The world-wide Hilti System requires men of calibre in London, Midlands, Sussex, Norfolk and North Wales. We offer steady employment, high earnings through salary, commission and expense allowances, very interesting and satisfying work with full possibility of continuous progress.

Conscientious and efficient work required and ability to approach people at every level on fastening problems.

The electrical and building trades are the main fields in which we offer important savings to our customers. Wide knowledge in these trades an advantage. Car essential.

Please send full details of background, salary and future plans to:—

The Product Manager
UCAN DEVELOPMENT LIMITED
Dome Buildings, The Quadrant, Richmond Surrey

4279

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

ASSISTANT ENGINEER (Instruments), Kingston B Generating Station.

Applicants should preferably possess Higher National Certificate and must be experienced in maintenance, testing and calibration of all types of power station instruments. A knowledge of electronics would be an advantage.

Class G, Grade 9, £885-£930 per annum, including London allowance. N.J.B. conditions of service.

Applications giving details of education and present position, experience, etc., should be forwarded to the Station Superintendent, Kingston B Generating Station, Downhall Road, Kingston-on-Thames, Surrey, not later than 5th August, 1958. 4280

Vacancy for an
ELECTRICAL ENGINEER

(for airport work) in the Department of Industry and Commerce, Dublin. Salary scale: Man, £615 (or higher) to £1,044 and advancement after three years' satisfactory service to the scale £860-£1,166. Age limits: 21-35 years. Essential: Degree in Electrical (or Mechanical and Electrical) Engineering or have been recognised by the Institution of Electrical Engineers as qualified for graduate membership.

Application forms and further particulars from the **Secretary, CIVIL SERVICE COMMISSION, 45, Upper O'Connell Street, Dublin.** Latest date for receiving completed application forms, 21st August, 1958. 4270

SOUTH OF SCOTLAND ELECTRICITY BOARD

Stirling Area

APPLICATIONS are invited for the following Headquarters posts in this Area:—

1. FOURTH ASSISTANT ENGINEER in the Planning and Development Department (Schedule A, Class J, Grade 12); and
2. FOURTH ASSISTANT ENGINEER in the Test and Protection Department (Schedule A, Class J, Grade 12).

Candidates should have had a sound engineering training and experience in the type of work to be undertaken and be in possession of a National Certificate in Electrical Engineering or the equivalent.

Conditions of service will be in accordance with the National Joint Board Agreement, the salaries being within the scale £790/£835 per annum. Both posts are superannuated.

Application forms, obtainable from the undersigned, are to be returned not later than 18th August, 1958.

JAMES G. CURTIS,
Area Manager.

Woodlands,
St. Ninians Road, Stirling.
17th July, 1958. 4287

SOUTH WESTERN ELECTRICITY BOARD

Torbay District: Torquay

APPOINTMENT OF SURVEYOR

APPLICATIONS are invited from suitably qualified and experienced persons for the above appointment.

Salary according to Schedule D, Grade 6 (£595 × £20 to £715 per annum) of the N.J.B. Agreement.

The person appointed will be required to survey and peg out routes for overhead lines, including the production of profiles and the fixing of pole positions. He may also be required to survey and mark out substation sites and, where necessary, to discuss with landowners and tenants the routing of mains over their properties. On occasions he may be required to obtain signatures to wayleave documents.

Experience with the use of dumpy and Abney levels is essential, and experience in the use of a theodolite will be an advantage.

Applications to be made on official form OBTAINABLE BY POSTCARD ONLY from District Manager, South Western Electricity Board, Electric House, Union Street, Torquay. Closing date for receipt of completed applications is 9th August, 1958. 4294

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Graduate Membership of I.E.E. or I.Mech.E. an advantage.

ASSISTANT SHIFT CHARGE ENGINEER,
Stepney Power Station
(Vacancy No. 58/535).

Sound technical training, with experience of pulverised fuel firing an advantage. Salary Class F, Grade 9 = £830, plus £79 shift p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 6th August, 1958. 4255

BOROUGH OF EDMONTON

Electrical Assistant
Borough Architect's Department

THE Council require a suitably qualified Electrical Assistant to take charge of the electrical section of the Borough Architect's Department. Applicants must have had sound experience in practical installations, controlling labour, organising routine maintenance, supervising contracts, designing installations and estimating.

Grade APT II, £725 × £30 to £845, plus London weighting £10-£30 according to age. 44-hour week.

Applications on forms obtainable from Town Clerk, Town Hall, Edmonton, must be delivered by 8th August. 4292

Situations Vacant (continued)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Division

Appointment of Station Chemist
Stella South Power Station

APPLICATIONS are invited for the appointment of STATION CHEMIST at Stella South Power Station.

Applicants should have good experience in modern analytical and physical chemistry and be conversant with boiler feed and water treatment. The possession of a University Degree in Chemistry or A.R.I.C. is desirable.

The salary for the appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule A, Grade 7, Class K (£1,160-£1,235 per annum).

Forms of application may be obtained from Divisional Establishments Officer, Central Electricity Generating Board, North Eastern Division, Carliol House, Newcastle upon Tyne, to whom they should be returned to arrive not later than 6th August, 1958. 4233

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable appointment at Board Headquarters, Glasgow :—

FOURTH ASSISTANT ENGINEER
(Measurements), Technical Section,
Chief Engineer's Department.

Candidates should possess a Degree or Higher National Certificate in Electrical Engineering and should have experience in testing and calibration of indicating instruments, single-phase and polyphase meters, current transformers and voltage transformers. Additional experience in the field of summation metering and E.H.T. metering would be an advantage.

Salary £710/£935 per annum in accordance with Class AX/EX, Grade 8 of Schedule B to the National Joint Board Agreement.

Apply, quoting Reference No. E29/58, on standard form AE.6, available from the Secretary, P.O. Box 173, 351, Sauchiehall Street, Glasgow, C.2, not later than Saturday, 16th August, 1958. 4286

LEEDS COLLEGE OF TECHNOLOGY
Cookridge Street, Leeds 2

Principal: C. Chew, M.Sc.Tech., F.R.I.C.

APPLICATIONS are invited for the post of ASSISTANT LECTURER (Grade B) in Electrical Engineering, duties to commence as soon as possible. Applicants should possess recognised technical qualifications, together with teaching and industrial experience. Salary in accordance with the Burnham Technical scale, £650 × £25 to £1,025 per annum with full allowances for training, industrial and teaching experience.

Further particulars and form of application, to be returned by the 8th August next, may be obtained by sending a stamped addressed foolscap envelope to the Principal of the College.

GEORGE TAYLOR,
Chief Education Officer.

Education Department,
Leeds, 1. 4226

WATCHMAKERS/
WATCH REPAIRERS

are required to repair small delicate mechanisms in the Instrument Department of a large chemical works.

Applications should be made to the:—

Labour and Welfare Officer (Oldbury)
MESSRS. ALBRIGHT & WILSON (MFG.) LTD.
Oldbury
Nr. Birmingham

4249

CLASSIFIED ADVERTISEMENTS ARE PREPAID

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

SHIFT CHARGE ENGINEER is required at Hams Hall "B" Power Station, Lea Marston, Sutton Coldfield, Warwickshire. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K7, £1,160-£1,235 per annum, plus 10% shift allowance.

A sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear are required. Knowledge of pulverised fuel firing would be an advantage. Appropriate qualifications desirable.

Apply, quoting vacancy number 842MD, on form AE6, available from the Establishments Officer, 53, Wake Green Rd., Moseley, Birmingham, 13, by 11th August, 1958. 4825

APPRENTICE TRAINING CENTRE

VICKERS-ARMSTRONGS (SHIPBUILDERS) LIMITED

APPLICATIONS are invited for the following pensionable staff vacancy :—

AN ELECTRICAL INSTRUCTOR.

The Instructor appointed will be required to prepare craft apprentices for the City and Guilds of London Institute Examinations.

Candidates should possess sound technical qualifications as well as the highest personal qualities and a genuine interest in and flair for the training of young persons. The salary offered will be within the Burnham Scale framework.

Applicants should state their present salary, the salary they require, and should submit their applications to the Personnel Manager, Naval Yard, Walker, Newcastle upon Tyne, 6.

4103

THE RUGBY PORTLAND CEMENT CO. LTD.
has vacancies for:—

1. A SKILLED ELECTRICIAN for shift maintenance work. Experience with heavy motors and switchgear essential.
2. An INSTRUMENT MECHANIC to maintain a wide range of instruments, but mostly electrical.

Positions are permanent for suitable applicants and there are good prospects of promotion. A house may be available.

Apply to:—
The Works Manager
Southam Works
Long Itchington
Southam

between 8.30 a.m. and 5.30 p.m. (8.30 a.m. to noon on Saturday) or write for an appointment.

4225

Applications are invited by
FREDERICK S. SNOW & PARTNERS
for
an ELECTRICAL ENGINEER to be posted at the new Gatwick Airport. Applicants should have a sound training and experience for the duties of maintenance engineer. The scope of work includes H.V. and M.V. distribution, power standby plant, and a wide range of electrical installations within buildings. Applicants should be members of the Institution of the Electrical Engineers, and preference will be given to those of Corporate grade. Candidates should send in confidence, full particulars of education, training and experience to:—
FREDERICK S. SNOW & PARTNERS
Box No. 116
Monro Buildings
Wellington Street, London, W.C.2. 4271

Applications are invited by
FREDERICK S. SNOW & PARTNERS
for
ELECTRICAL ENGINEERING ASSISTANTS

Senior, Intermediate, and Junior Grades for the design, specification and detailing of various electrification projects. The scope of work includes power distribution, electrical installations comprising heating, lighting and power in buildings of industrial, commercial and technical usage. Applicants for senior and intermediate grades should preferably be to H.N.C. standard, junior grades to O.N.C. standard, of technical education with apprenticeship or equivalent training or applicable experience. Candidates should send in confidence, full particulars of education, training and experience to:—
FREDERICK S. SNOW & PARTNERS
Box No. 116
Monro Building
Wellington Street, London, W.C.2. 4272

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

STATION SHIFT CONTROL ENGINEERS are required at Meaford "A" Power Station. N.J.B. service conditions, superannuable appointments, salary within Schedule A of the Agreement, Grade G.10, £790-£835 per annum, plus 10% shift allowance.

A sound technical training and practical experience in the control of steam generating plant and main switchgear are required. Appropriate technical qualifications an advantage.

Apply, quoting vacancy number 837MD on form AE6, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 7th August, 1958. 4236

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER (Technical) required in the Sub-Area Engineer's Department, based on Legacy, Near Wrexham. Salary within range £935/£995 per annum (N.J.B. K/10).

Duties will include the commissioning and maintenance of protective gear and the testing of electrical plant.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, Near Wrexham. Closing date, 6th August, 1958. 4238

ELECTRICIANS

required for interesting work in connection with instrumentation in a large chemical works.

Applications should be made to the:—

Labour and Welfare Officer (Oldbury)
MESSRS. ALBRIGHT & WILSON (MFG.) LTD.
Oldbury
Nr. Birmingham

4247

EASTERN ELECTRICITY BOARD

Chilterns Sub-Area Headquarters

THIRD ASSISTANT ENGINEER (Operation and Maintenance). Duties will include supervision of the maintenance of 33-kV substation equipment and overhead lines by direct and contract labour.

Salary N.J.B. Class L, Grade 10 (£995-£1,055 p.a.).

Apply by letter within 14 days to the Manager, Chilterns Sub-Area, Eastern Electricity Board, Prebend Street, Bedford. 4281

PIPE FITTERS

required for interesting work with prospects of training to become instrument fitters at a later date.

Applications should be made to the:—

Labour and Welfare Officer (Oldbury)
MESSRS. ALBRIGHT & WILSON (MFG.) LTD.
Oldbury
Nr. Birmingham

4248

ACCOUNTS clerk required by electrical contractors, London, S.W.1. Preferably with knowledge of trade and some book-keeping experience. Good opportunity for keen young man. Write giving experience and salary required.—Box 4229.

AGENT required for the London area by a firm engaged in the manufacture of domestic electrical appliances. Must have a live connection with the wholesale trade; commission basis. Reply giving full details to—Box 4230.

AGENT with existing connections electrical wholesalers, supply authorities, large contractors in London area. High class electric fires, lighting fittings.—Box 9417.

ASSISTANT to manager of power dept. of important electrical manufacturers in London area. Applicants should preferably be Members of the I.E.E., possess a university degree, and have served an apprenticeship with an engineering firm. General experience of heavy electrical plant and some commercial knowledge would also be an asset. The position offers prospects to a young man under thirty. Write giving personal details, qualifications, experience, age and present remuneration and position to—Box 4262.

BRITISH OXYGEN GASES Limited require the services of an electrical draughtsman of intermediate standard. Technical qualifications to O.N.C. standard, or equivalent, required and at least 2 years' drawing office experience. Please address applications to—Personnel Manager, Spencer House, St. James's Place, London, S.W.1. 4220

CENTRAL London wholesalers (electrical and television) require salesmen who can bring business in on salary and profit sharing terms. Will also benefit through existing accounts. State salary and full particulars in strict confidence to—Box 4163.

CONSULTING engineer requires junior electrical engineer/draughtsman, minimum qualifications O.N.C., aged 21/25, to be employed in installation design of factories, offices, schools, etc. Superannuation scheme, meal vouchers. Applicants must state salary required, qualifications, age, educational background and experience.—G. H. Buckle and Partners, 2, Harrington Gardens, London, S.W.7. 4296

CONTROL gear engineer required, age 23-35, for layout and circuiting of contactor equipment. Good salary. Permanent and progressive position. Canteen, pension scheme. Write stating age, experience and qualifications, if any, to Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middlesex. 273

EDITORIAL assistant (male) required by technical book publisher. Experience of make-up and progressing of material to printer desirable. Electrical or radio/electronics background an advantage.—Box 4244.

ELECTRICAL contracts/sales engineer. Opportunity for young engineer with commercial outlook, minimum academic qualifications O.N.C., knowledge of meters and relays an advantage. Write in confidence giving full details, experience, age and salary, to—Secretary, Chamberlain & Hookham Limited, New Bartholomew Street, Birmingham, 5. 9421

ELECTRICAL :—Development engineer required for household appliances. Must be thoroughly experienced in the latest electrical practice for cooking utensils, kettles, etc. Progressive, interesting and permanent job for man of the right experience. Applications, which will be treated in strict confidence, to—N. C. Joseph Ltd., Stratford-on-Avon. 4266

ELECTRICAL engineer required by Engineering Service Installations Ltd., 258, Gray's Inn Rd., London, W.C.1. Experienced in design preparing specifications and estimating for all types of electrical installations. Canteen facilities, superannuation scheme. Please write giving details of experience and salary required, marked confidential, Manager, Electrical Department. 4222

KEEN young draughtsman with machine shop training required for small production drawing office of company engaged in the manufacture of control gear equipment. Electromechanical experience desirable but not essential. Permanent and progressive position. 5-day week, pension scheme, canteen, etc. Apply giving full details of age and previous experience to Personnel Officer, Dewhurst & Partner Ltd., Inverness Road. Hounslow, Middx. 278

MANAGER for small company manufacturing electrical control gear, N.W. area. Write stating experience and salary required.—Box 4221.

MEGGER insulation tester.—J. S. Ramsbottom & Co. Ltd., Bow Street, Keighley. 4267

METER tester, Preston. Applicants must have previous experience in the testing of A.C. credit and pre-payment house service pattern meters. Experience in polyphase meter testing will be an advantage. Rate of pay, 55.5d. per hour, equivalent to £10 3s. 6d. for a 44-hour, 5-day week. In addition a productivity allowance of 8s. 3d. per week will be payable after four full pay weeks' service. N.J.I.C. conditions. Applications to Sub-Area Manager, No. 4 Sub-Area, the North Western Electricity Board, 40/41, Lune Street, Preston, by the 2nd August, 1958. 3235

PHILBLACK Limited require a development engineer for their Carbon Black Works at Avonmouth. Applicants should hold a B.Sc. degree and the equivalent of a professional qualification. Whilst experience of the carbon black industry is not expected, experience of chemical or petroleum plants, electrical installations or instrumentation will be an advantage. The position will appeal to an able and alert man who is able to work on his own initiative and who is interested in going ahead with a young and growing company. The starting salary will not be less than £1,000. Contributory pension scheme. Apply to the Works Engineer, Philblack Limited, Avonmouth Docks Estate, Avonmouth, Bristol, stating experience, qualifications and age. 4245

REPRESENTATIVES required by old-established electrical distributors. Existing connection an advantage, but intimate knowledge of electrical wholesaling of greater importance. Vacancy exists at Bristol branch, also London. State full details of experience, age, etc.—Box 4265.

ROYAL NAVAL SCIENTIFIC SERVICE requires senior scientific officers and scientific officers for establishments in London area, Baldock, Portsmouth, Portland, Poole, Greenock and Rosyth. Main requirements are about 25 vacancies for physicists, electronic engineers and mathematicians in areas specified. The following particular vacancies also exist: mechanical engineer for work on gas turbine problems in the London area; mechanical engineer for work on design and development of u/w devices in Portland area; metallurgists for Rosyth and Poole; chemists (physical and inorganic) for Poole area, Baldock and London. Candidates must normally be natural-born British subjects of natural-born British parents, with at least first or second class honours degrees or equivalent high professional attainments. S.S.O.s must have had at least three years' postgraduate experience and be not less than 26 years of age. Salaries (men): S.S.O. £1,190-£1,410; S.O. £635-£1,110 (London); somewhat lower in Provinces. Appointments unestablished (with F.S.S.U. benefits), but opportunities may occur for those between the ages of 21 and 32 to compete for established posts. Forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting A98/8A. 4257

SALES order clerk required by S.E. London wholesalers. Good prospects with superannuation. Write giving age, details of previous experience and salary required.—Box 4232.

SALES order clerk required. Senior post, well paid position offering scope in the future. Superannuation scheme, canteen and social club facilities. Experience of electrical wholesaling essential. Apply to—Halsey's Electric Co. Ltd., Brandon House, Wyfold Road, London, S.W.6 (Fulham 3355). 4263

SALES representative required for London area by established electrical domestic appliance manufacturers. Essential knowledge of wholesalers, merchants, etc. Salary and commission basis, existing accounts handed over.—Box 4105.

SITE supervisors and plumber-jointers required for cable installation work throughout the country including North London. Apply—Box 4213.

TECHNICAL assistant reqd. in electrical and mechanical engineering section of chief engineer's dept. with expce. of modern electrical and mechanical installations in large buildings. Expce. of heating and ventilating an advantage. Graduate or associate membership of recogn. prof. body preferred. Salary up to £860 p.a. accdg. to quals. and expce. Application form from Chief Engineer (58/65), L.C.C., County Hall, London, S.E.1 (1339). 4243

SENIOR engineers reqd. with a view to taking control of a group engaged in the design of precision regulated power supplies. Candidates should be in age range 30-40 and have a degree in electrical engineering together with some industrial experience. Knowledge of Servo control using transistor and magnetic amplifier techniques as applied to regulated power equipment would be an advantage. The position will carry a substantial salary according to age and qualifications. Applicants are invited to send full details in confidence to the Staff Officer, Ref. 744/20, Siemens Edison Swan Ltd., Woolwich, London, S.E.18. 4167

STAFF required to maintain the electrical and mechanical services in large new office building now nearing completion in Grosvenor Place. Preference will be given to applicants with sound knowledge of ventilation, refrigeration, pumps and cinema equipment. Apply in writing to—Maintenance Manager, A.E.I. Ltd., 33, Grosvenor Place, London, S.W.1. 4239

STOREKEEPER required, must be experienced and fully conversant with electrical wholesale trade. Good wages and conditions, superannuation scheme, canteen and social club facilities. Apply to—Halsey's Electric Co. Ltd., Brandon House, Wyfold Road, London, S.W.6 (Fulham 3355). 4264

SWITCHGEAR designer required for M.V. and H.V. air and oil break switchgear. Works situated 20 miles N.W. London. Good prospects, salary commensurate with technical qualifications and ability. Housing assistance. Applications marked "Confidential," stating age, experience, etc., to—Chief Engineer, J. G. Statter & Co. Ltd., Amersham Common, Bucks. 4216

TECHNICAL representative required by Northern manufacturer of specialised flameproof and industrial lighting, cable glands and sound power telephones. Territories, London and Home Counties. Pension scheme, company car, remuneration commensurate with age, experience, qualifications, etc. Please apply with full details, also stating whether office facilities available, to—Box 4223.

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

A.M.I.E.E., graduate, ex R.N.V.R. radar officer, 29, now designing heavy electrical equipment, seeks different position of responsibility in South.—Box 9426.

A.M.I.E.E., 46, executive experience all aspects sales, contracts, design, development, liaison, publicity in switchgear, motor control, cables, overhead lines, etc., seeks responsible senior position.—Box 9430.

ELECTRICAL sales engineer, 32, A.M.I.E.I., A.M.I.B.E., A.M.A.S.E.E., seeks position as technical representative.—Box 9418.

ELECTRICIAN. Gen. contracting, A.M. contracts, inc. setting out, as-fitted plans, final measurements. Capable of site and area office supervision. Own transport.—Box 9427.

ELECTRICIAN seeks overseas work; served number of contracts abroad.—Box 9423.

ELECTRICIAN (37), seeks maintenance work, Sussex or Hants.—Box 9424.

EXECUTIVE, extensive experience electrical wholesale industry, seeks responsible position London.—Box 9415.

FOREMAN electrician and electrician seek positions preferably but not necessarily overseas. Time served 16 years in trade. Experience all types of installations.—Box 9410.

MAINTENANCE electrician used to light and heavy industrial installations; shift work.—Box 9428.

MAINTENANCE supervisor, wide industrial experience installation and maintenance, incl. diesel alternators, seeks change.—Box 9416.

REP., first-class industrial and commercial connection in East Anglia and South Midlands, seeks change.—Box 9408.

YOUNG man, 32, A.M.A.S.E.E., manager contracting business, seeks position where practical knowledge and adaptability is of more value than business acumen and where opportunity of further study is available. Suggestions welcomed. All replies acknowledged.—Box 9420.

SALES BY AUCTION

E. R.
By Order of the Secretary of State for Air

No. 14 M.U., R.A.F., CARLISLE
(Goods stored at
SANDYSIKE and BLACKWOOD
9 miles north of Carlisle)
SALE BY AUCTION
THURSDAY, 14th August, 1958
at 10.30 a.m.
Sale in County Hall, Carlisle
525 lots of
ELECTRICAL AND INDUSTRIAL MACHINERY AND SUNDRIES
including briefly:
Calibrator Tachometers, Motor Blowers, Pumps, Trolley Equipment, Generators, Alternators, Transformers, Compressors, Charging Sets, Electric and Starter Motors, Distribution Boxes, Receivers, Transmitters, Master, Power and Control Units, Test Sets, Radio Sundries, Instruments, Accumulators, including 14,000 Lead Acid 6 v., 75 Ah. to 180 Ah.; Slide Rules, Sound Recorder Equipment, including 5 Tape Recorders, 2,000 marching and other compasses, 1,500 aircraft clocks, watches, Binoculars, tools, teleprinting, telephone and photographic goods, hosing, metals, furniture, textiles, etc.;

Also large quantity of Motor Vehicle Engines and Sundries, including Thornycroft, Bedford, Austin and Standard engines, radiators, gear boxes, pistons, etc.

VIEWING, Tuesday and Wednesday, 9 to 4.30 p.m. and on sale morning, Thursday, to 10.30 a.m. but see catalogue for details.

CATALOGUES 1s. each, admit TWO to viewing but ONE ONLY to sale, from the Auctioneers:

HARRISON & HETHERINGTON LTD.
Carlisle
(Phone 26292/3; Telegrams, " Sales ")
4227

ARTICLES FOR SALE

NEWMAN

Diesel Engines and Sets for Sale for Immediate Delivery

1,000-h.p. ENGLISH ELECTRIC 8-cylinder type 8RL Diesel Engine. Speed 375 r.p.m. Can be supplied with 900-kVA, 400-volt, 3-phase, 50-cycle Alternator if required.

110-h.p. CROSSLEY twin-cylinder Vertical Diesel Engine, type RVD.2. Speed 350 r.p.m.

493-kVA PETTER/BRUSH 6-cylinder, 600-r.p.m. Diesel Engine and direct-coupled 493-kVA, 400-volt, 3-phase, 50-cycle Alternator and Switchgear (two available).

220-kVA GENERAL MOTORS Model 8.268A, 1,000-r.p.m. Diesel Engine and direct-coupled 220-kVA, 3-phase, 50 cycle Alternator and Control Panel.

62.5-kVA PAXMAN/CROMPTON PARKINSON 5-cylinder radiator-cooled Diesel Engine, 1,000 r.p.m., and direct-coupled 62.5-kVA, 400-volt, 3-phase, 50-cycle Alternator and Control Panel.

NEWMAN INDUSTRIES LIMITED
Yate, Bristol
(Telephone: Chipping Sodbury 3311) 372

ROLLING MILL DRIVES

FOUR 400-h.p. Rolling Mill Slipring Motors by the ENGLISH ELECTRIC Co., wound for 415 volts, 3-phase, 50 cycles, 738 r.p.m., coupled to gearbox by POWER PLANT Co., final speed 30 r.p.m. High speed shaft with two flywheels, total kinetic energy 10,000 h.p. seconds. 30 h.p. barring motor and automatic IGRANIC control gear with slip-resistance.

750-h.p. Rolling Mill Motor by BROWN BOVERI, date 1954; 2,200 volts, 3-phase, 50 cycles, 146 r.p.m.

GEORGE COHEN SONS & CO. LTD.
Wood Lane, London, W.12
(Tel. Shepherds Bush 2070) and
Stanningley, Nr. Leeds
(Tel. Pudsey 2241) 4183

HOUSE SERVICE METERS

200-240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.

UNIVERSAL ELECTRICAL CO.
221, City Road, London, E.C.1 37

NEW OXFORD TRANSFORMER WELDERS

For Immediate Delivery

160/450 amp. sizes, oil cooled pattern for operation on 400/440 v. single phase, or 200/240 v., dual welding voltage 50/80; in-built coarse and fine regulators.

Prices as follows: 450 amp. £135.
350 amp. £99 10s.
250 amp. £71.
180 amp. £45.

GEORGE COHEN SONS & CO. LTD.
Wood Lane, London, W.12
(Tel. Shepherds Bush 2070) and
Stanningley, Nr. Leeds
(Tel. Pudsey 2241) 3850

YORKSHIRE ELECTRICITY BOARD

TENDERS are invited for a quantity of surplus electrical installation material, including conduit boxes and conduit fittings, a comprehensive list of which can be obtained from the Sub-Area manager, 1a, Denby Dale Road, Wakefield.

Tenders should be received at this address not later than Wednesday, 30th July, 1958.
4298

ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., 1/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.

ALBERICE METER COMPANY
Fairfax Works, Fairfax Rd., London, N.8
(Tel. MOUntview 7944, 6373) 191

A.A. ELECTRICAL Co. for A.C.-D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd., London W.4. 57

ABABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.: one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS, generators, 1-100 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

ALTERNATORS from ½ to 675kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

BARGAINS in electric motors from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Ring Monarch 3355. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 140/-. See Quarterly.—Tradex, Surbiton. 170

B.T.H. ¾-h.p. geared motors, 400 v., 3-ph., 50 c., 350 r.p.m., unused, £12 10s.—Universal Electrical Co., 221, City Rd., London, E.C.1. 3937

CABLE, underground, all types ex stock.—E. M. Tatton Co. Ltd., Kew Bridge, Brentford (EALing 3155/6). 117

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists.—Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS and motor-alternators, 24, 110 and 220v. D.C. to 230/1/50 A.C., 125 watts to 6 kVA in stock.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

ELECTRIC motors, generators, control gear, transformers, A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9 (Colindale 4621-2). 42

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, " Electrical Surplus," containing thousands of items of electrical plant, sent on request.—F. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

ELECTRICIANS. Send for details Shaftesbury lightweight " Bantam " ladders. Top sections fitted with patent moulded rubber blocks, eliminate possibility of scratching or marking walls, fascias, and other painted or highly polished surfaces. Also available for immediate delivery, steps, platform steps, trestles, telescopic trestles, pole and builders-type ladders, and all sizes of two and three-section extension ladders.—Shaftesbury Ladders Ltd. (E.R.), 453, Katherine Road, London, E.7 (Phone: Grangewood 3363/4). 111

FLUORESCENT fittings, lamps, starters and control gear for home and export. Fully guaranteed by actual manufacturers. Send for catalogues.—The Anglo-American Electrical Company, Olive Street, Bury, Lancs. 245

FLUORESCENT tubes reconditioned and guaranteed as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks.—The Anglo-American Electrical Company, Bury New Road, Breightmet, Bolton, Lancs. (Telephone, Bolton 7251). 212

FREQUENCY changers and variable frequency M/A sets in stock, and to specification.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 148

GENERATING plants of all types, new and reconditioned up to 100 kVA in stock. Special plants built to order at short notice; automatic mains failure, etc.—Powerco Ltd., 312, York Rd., London S.W.18 (VAN. 5234). 151

GENERATING sets for sale, petrol, diesel and steam, from 1 kW up to 700 kW, A.C. and D.C. switchboards.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 163

HIGH frequency alternators and converters, 400 to 2,600 cycles up to 6 kVA in stock. Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 149

MOTOR generator sets and converters, all sizes and voltages from ½kW up to 500kW in stock.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTOR generators of all types in stock and to specification up to approx. 100 kW.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 152

MOTORS, starters, circuit breakers. Huge stocks of all types, ½ to 300 h.p. Stock list or quote by return.—J. S. Ramsbottom & Co. Ltd., Bow St., Keighley (3774-5-6). 70

NAMEPLATES, engraving, diesinking, stencils.—Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

PHASE converters, single to three-phase, several sizes in stock up to 90 h.p., 3-phase loading.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. or D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

PREPAYMENT 1s. slot house service meters.—Universal Electrical, 217-221, City Road, London, E.C.1. 36

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switch-holder incorporated is proving itself the most popular unit. Suitable for most fittings. 5/8. 6d. each subject.—F. F. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

QUARTERLY Credit Meters, single & poly-phase, 2½-100 amps. From 17/6d. Also D.C. See Television.—Tradex, Surbiton. 171

ROTARY converters in stock, all sizes; enquiries invited. — Universal Electrical, 221, City Road, London, E.C.1. 34

ROTARY converters, two, for sale, 10 kW each, 230 D.C. input, 230/1/50 output. £90 each. Full details — Electroproducts Co., Field Road, Busby, Glasgow. 4261

SINGLE and double batch type air circulation electric chamber furnaces, complete with electrical switchgear and chargers. Excellent condition. Cheap to clear. Ring for inspection. —Seven Kings 2553. 4259

SLYDLOK fuses for sale.—Ryness Supplies, 37, Goodge Street, London, W.1. 284

SMALL BR screws and nuts in steel, brass and stainless steel, from stock. — Premier Screws & Repetition Co. Ltd., Woodgate, Leicester. 180

TELEVISION slotmeters & Time Switches. Details from: Tradex Meter Co., Surbiton. Elmbridge 4487. 172

VENNER time switches, 200-240 v. A.C./D.C., 10-50 amps., 75s. each.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

WANTED. Large buyers of house-wiring cables and flexibles at special prices. Apply—Box 4218.

WARD Leonard motor generating sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

37 Gresham H.T. transformers, 230/1/50 input, 8,000 v. output, 4.3 kVA.—C. & C., 4, Dock St., London, E.1 (ROY. 4492). 4295

400-cycle to 1,500-cycle motor alternators and alternators.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 27

5,000-volt flash or insulation testers by famous makers offered as M.O.S. surplus. Output voltage 0-5,000 v. A.C. and D.C. continuously variable from zero. Current 10 ma/A.C. and 5 ma/D.C. Power supply 200/250 v. A.C., 50 cycles. A beautiful brand new instrument in modern sheet steel case with fully protective features incorporated, which may be ordered with every confidence at the unrepeatable figure of £27 10s. each delivered.—J. H. Elsby, Market Vaults, Market Street West, Birkenhead (Tel. 8566). 4011

EQUIPMENT FOR HIRE

GENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW, diesel or petrol, stationary or mobile, sale or hire. 24-hr. breakdown service. — Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401). 46

RELIABLE, self-contained diesel electric generating sets for hire, 2.5 to 260 kW. Night and day maintenance service. Quotations by return. — Whitetrade Limited, Rochester, Kent (Tel. Chatham 41133, 3 lines). 294

ARTICLES WANTED

HARRINGTON & Sons, reclamation contractors, want redundant A.C./D.C. electric motors and transformers, stocks of cable, etc. — 109, Beaconsfield Street, New Beckton, East Ham, London, E.6 (ALB. 1388). 315

JOURNALS, periodicals, technical and scientific, wanted to buy for cash. Back volumes and sets. — E. R. Ashley, 27, East 21, New York, 10, N.Y., U.S.A. 61

MERCURY (Quicksilver) wanted. Write for packing instructions. Gold, silver and platinum also purchased.—Collingridge & Co. Ltd., Riverside Works, Riverside Rd., Watford (Tel. 5963). 114

QUICKSILVER & beryllium copper urgently required for best prices and prompt cash.—Sterling Products Ltd. (Ealing 9248). 293

SURPLUS laminations, enamel copper wire, screws, nuts, flex. Good prices paid. Full details to—Box 199.

TWO 14-kVAr capacitors, tank type, for 415/3/50.—Burleigh, Alpine Wks., Empire Way, Wembley, Middlesex. 4219

WANTED, D.C. and A.C. ball-bearing motors, motor generator sets, dynamos and alternators. Full details to — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 13

WANTED, Cambridge test set sub-standard meter, amps., volts and watts, and other sub-standard test meters.—Box 4240.

WANTED for prompt cash, ferrous and non-ferrous scrap, also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. & H. Cooper Ltd., 176, Brady St., Bethnal Green, London, E.1. 120

WANTED, rotary converters, any sizes.—Universal, 221 City Rd., London E.C.1. 35

WANTED. Secondhand electric water heater, capacity about 12 gallons. Apply —Abbot Brown & Sons Ltd., Beaminster, Dorset. 4242

WANTED, surplus stock cable, all types and sizes. We can inspect.—Box 220.

WORK WANTED AND OFFERED

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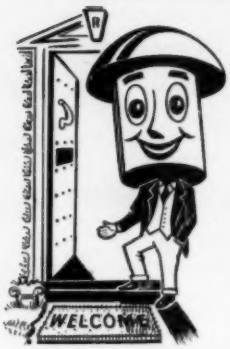

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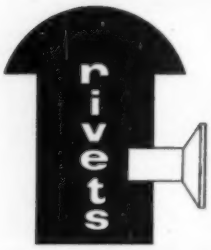

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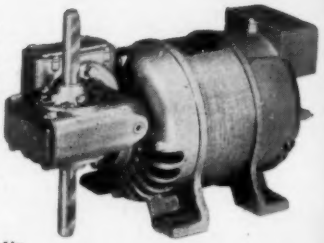

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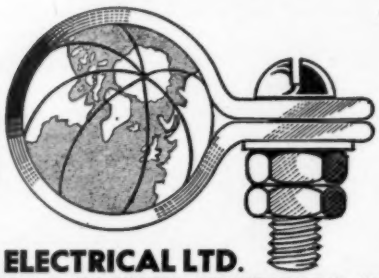

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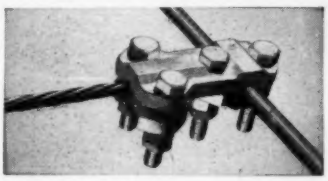

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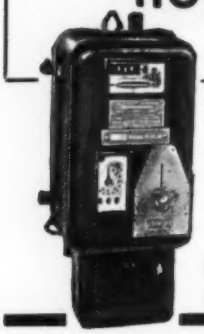

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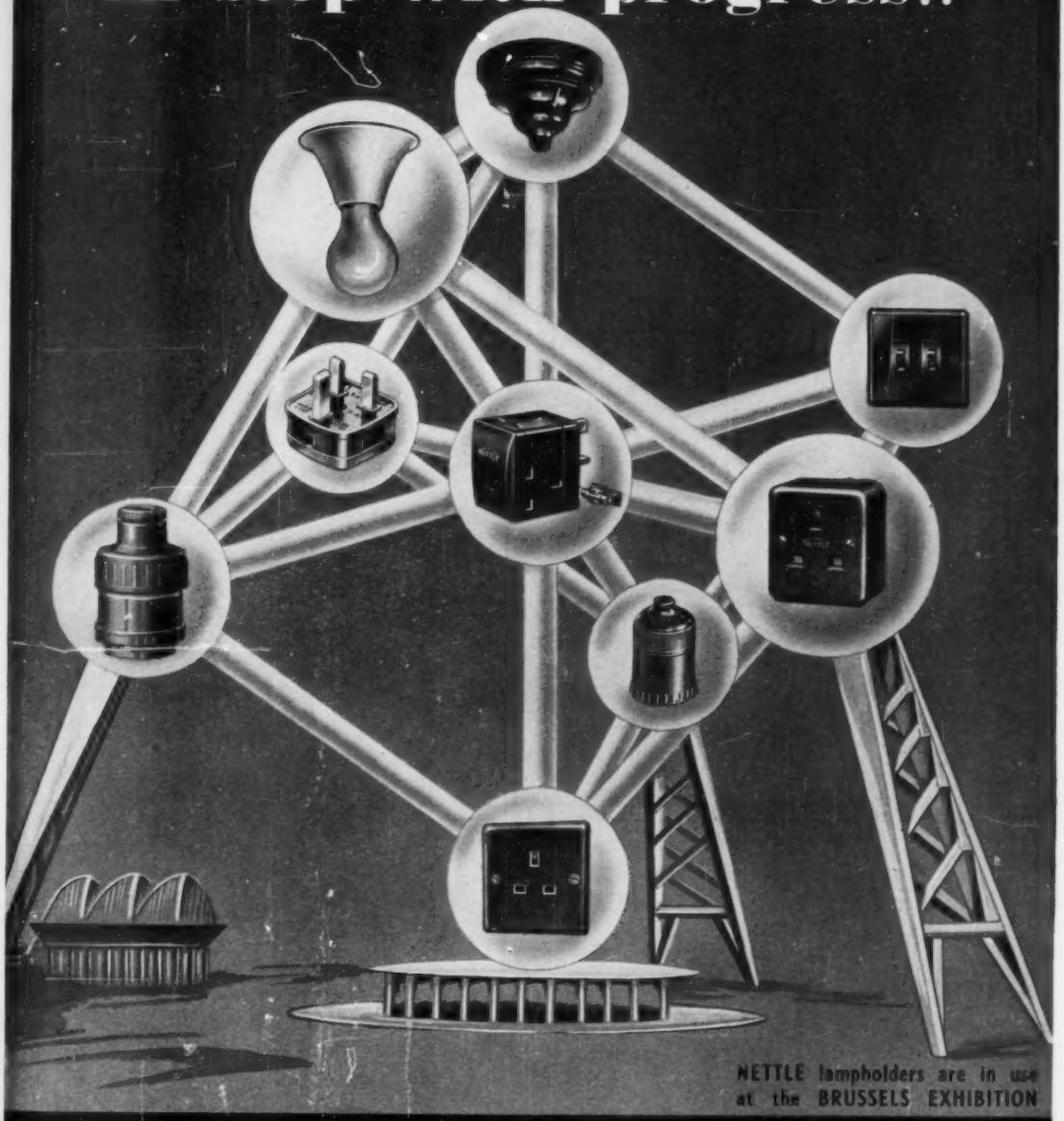

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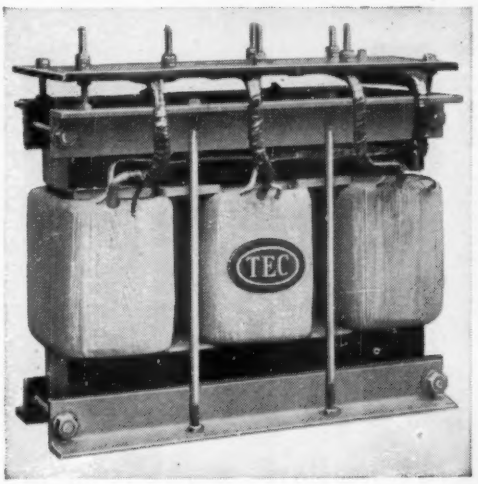

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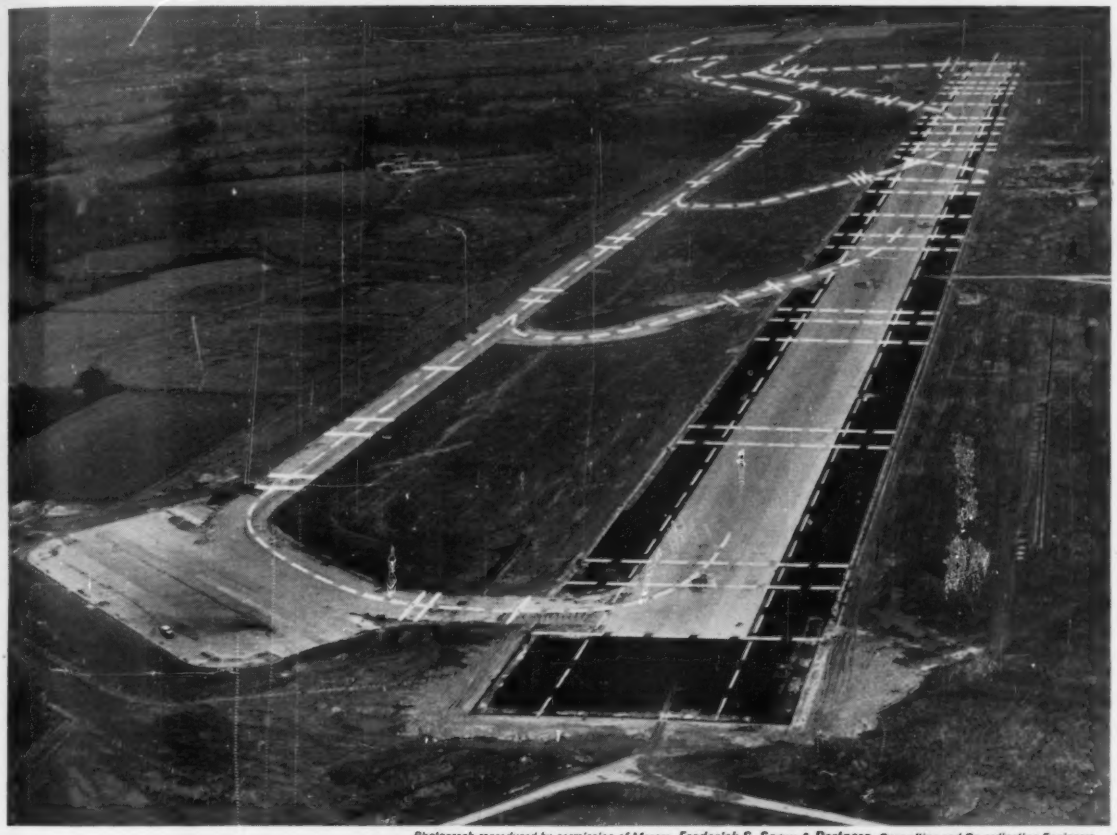

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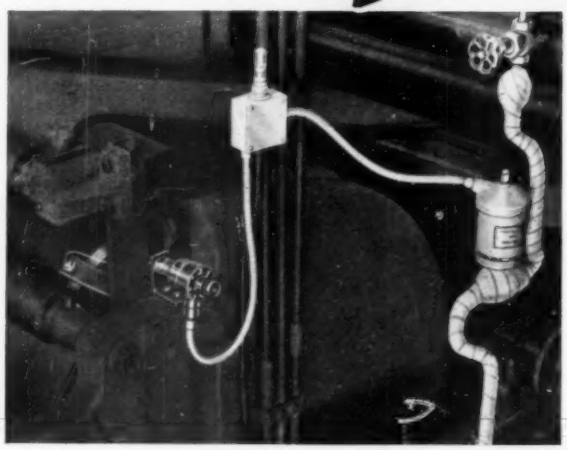

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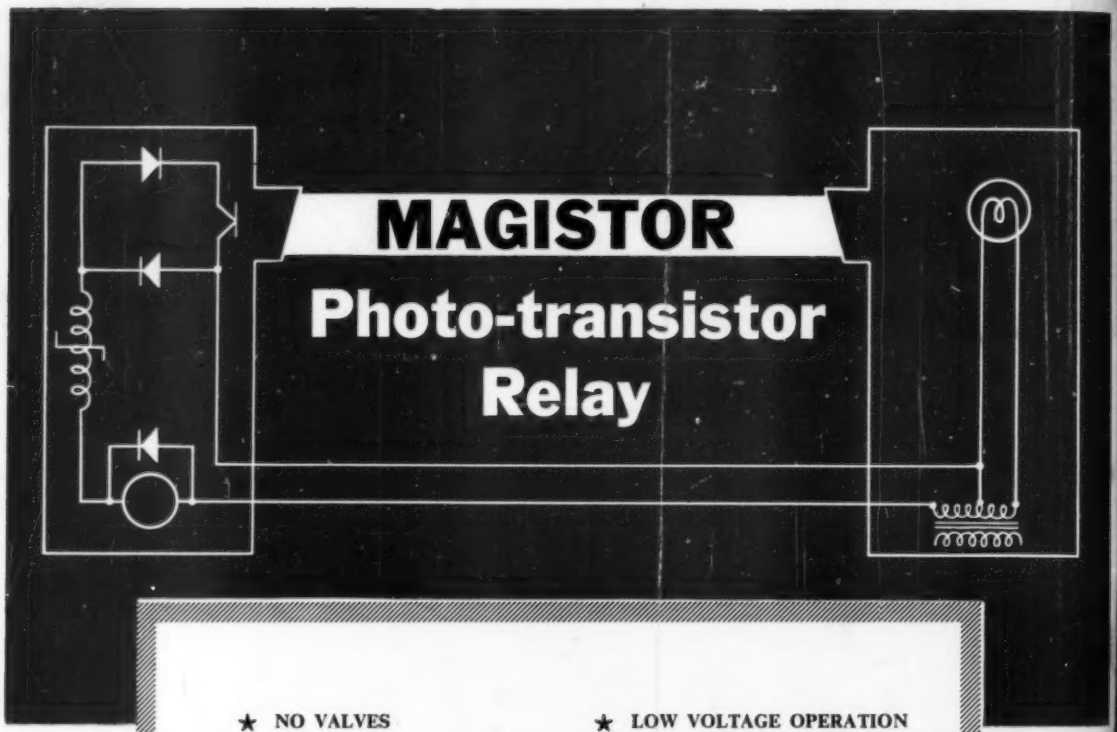

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